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ABSTRACT

The manual was designed to provide an overview of the Developmental Physical Management program used at the University of Alabama in classes for infants and children with multiple disabilities. The multidisabled child may be affected by one or more of the following problems: slow development, lack of normal integration of basic reflexes, abnormal muscle tone. Theory, basic assumptions, and the developmental sequence of instruction are discussed. Charts are presented which detail activities with the following aims: (1) normalizing muscle tone, (2) integrating basic reflexes, (3) facilitating desired muscle groups, (4) facilitating contraction, and (5) developing equilibrium are presented. Twenty-three techniques or uses of equipment are discussed, including vestibular stimulation, platform shoes, rubbing with towels, and the flexion seat. Among appendixes are a chart on the development of balance as it relates to reflex maturation, a glossary of terms, and references. (PHP)

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DEVELOPMENTAL PHYSICAL MANAGEMENT OF THE MULTI-DISABLED CHILD

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PURPOSE OF MANUAL

PURPOSE OF MANUAL

The purpose of this manual is to acquaint the reader with the Developmental Physical Management program (DPM) used at The University of Alabama in the multi-disabilities classes under the supervision of the Area of Special Education, Program of Multi-Disabilities.

DPM is an eclectic approach which has drawn from the theories of Miss Margaret Rood, OTR, RPT; Mrs. Shirley Randolph, RPT; Mrs. Francis Corley, RPT; A. Jean Ayres, Ph.D.; and Karel Bobath, M.D., and Berta Bobath, F.C.S.P. DPM encompasses a total approach concerning the specific care and handling of the multi-disabled infant both in the classroom and in the home.

This manual will be of special interest to professionals who deal with the child with multi-disabilities. Emphasis is placed on the child with cerebral palsy. It is hoped that teachers will be able to see clearly the importance of developmental physical management and the implications of proper positioning and management in an educational environment. Conversely, it is understood that incorrect management can adversely affect the learning process. Here, at The University of Alabama, this mutual concern is shared by the parent, the teacher, the therapists, and all who come in contact with the child. This collaboration has resulted in a blending of efforts, yielding a truly total approach to the management of the multi-disabled child.

These techniques should not be attempted without recommendation, authorization, and supervision from a qualified therapist. The teacher should only use this manual under qualified supervision. The leading therapists' names have been provided in order to give credit for the theories incorporated in DPM. However, they are released from any responsibility associated with the contents of this manual. It represents an adaptation of the theories as they may be used with multi-disabled children. The authors assume complete responsibility for the contents of the manual.

This manual is by no means a "cookbook remedy." The numbers of times to do a specific activity have been purposefully omitted. The amount of time spent in carrying out a procedure **has** to be controlled purely by the quality of response. The teacher must develop a trained eye. Blind memorization of the rules is not the answer. Each child is different.

ORIENTATION TO THE DEVELOPMENTAL PHYSICAL MANAGEMENT PROGRAM

ORIENTATION TO THE DEVELOPMENTAL PHYSICAL MANAGEMENT PROGRAM

THEORY

Theoretically, multi-disabled children do not progress through the normal developmental sequence necessary for proper maturation. Typically, the problem is three-fold: (1) The child is slow in developing. (2) The normal integration of the basic reflexes does not occur. (3) An abnormal muscle tone exists.

The multi-disabled child may be affected by one or more of these problems. Delays in developing may be seen in areas such as head control and sitting balance. Head control is expected in normal children at about four months and sitting balance at about eight months. In the multi-disabled child, these skills may be acquired much later. Basic reflexes may be present preventing the higher level reflexes from dominating. For example, righting and equilibrium reactions are frequently delayed. Abnormal muscle tone may cause the child to assume abnormal, asymmetrical positions and movement patterns. If left untreated, gross deformities such as scoliosis and contractures are likely to develop.

Often, tasks are skipped in the developmental sequence, depriving the child of the vital stimulation necessary for higher developmental tasks. This unfortunate chain of events sets the stage for the development of splinter skills. A splinter skill is one that is accomplished cortically or consciously by the brain at the expense of high energy; therefore, in times of stress, these skills are the first to disintegrate. It is essential that the early developmental tasks lay the foundation for the acquisition of higher level skills. It is our multi-purpose to integrate these developmental tasks to a reflex level, to encourage more normal muscle tone, and to elicit the normal progression of reflex development.

In addition to this developmental sequencing problem a sensory integration dysfunction is often present. Sensory integration dysfunction means an inability to either receive incoming data or stimulation in proper perspective; an inability to interpret, organize, or integrate this incoming stimuli with old data; or an inability to make an appropriate response. The threshold of response is often higher or lower than that of a normal child. With the higher threshold, a larger quantity of stimuli is needed to elicit a response; whereas, with the lower threshold, too much stimuli is recorded and is overwhelming to the child.

Sensory integration dysfunction can be treated with two effective techniques. The first is bombarding the child with stimuli. This bombardment normalizes the threshold of the response allowing the child to decode the incoming stimuli and respond appropriately. The second is the provision of purposeful sensory-motor activities which provides feedback to the child as to his performance. This purposeful movement becomes a powerful organizer of sensory input facilitating sensory integration.

BASIC ASSUMPTIONS

DPM adheres to the following assumptions:

(1) Assessment and treatment follow the normal developmental sequence.
- Treatment is done proximally to distally.

(2) Reflex maturation is encouraged.
- Integration of the vestibular mechanism is emphasized initially.

(3) Abnormal muscle tone is dealt with prior to positioning and movement patterns.
- Maintenance of straight body alignment is promoted.
- Initially stimulation is given to the less involved side of the body.

The normal developmental sequence is followed during assessment and treatment. For example, neck control, one of the first developmental milestones, is both assessed and treated before eye-hand coordination receives emphasis. The integration of the vestibular mechanism is necessary in order that proper reflex maturation will follow. An example is the emphasis given to the integration of basic residual reflexes such as the asymmetrical tonic neck reflex in order to eliminate the occurrence of deformities.

Abnormal muscle tone must be dealt with first to give the child the advantage of the most normalized muscle tone possible. This normalized muscle tone insures that the child will receive maximum benefit from positioning and movement activities. Providing stimulation to the less involved side of the body utilizes the concept of irradiation, cross over of more normalized muscle tone to the more involved side. In addition, a greater degree of success is provided when the less involved side is challenged first.

Our objective in following these basic assumptions is to promote sequential development in order that each subsequent developmental task will have as firm a base as possible on which to build. The following outline presents the normal developmental sequence which forms the basis for DPM.

DEVELOPMENTAL SEQUENCE

I. Integration of Vestibular Mechanism

II. Scapula Stability

III. Purposeful Voluntary Sucking

IV. Integration of Basic Reflexes

V. Development of Strong Neck, Trunk, and Hip Extensors

VI. Co-contraction

- A. Neck Control
- B. Trunk Control
- C. All 4's (creeping position)
- D. Standing
- E. Squatting
- F. Walking

VII. Balance

- A. Righting Reactions
- B. Protective Extension
- C. Equilibrium

VIII. Eye-Hand Coordination

IX. Fine-Motor Coordination

In developmental physical management, the order in which the activities are administered is of major concern; the normal developmental sequence is followed. By approximately six weeks of age, the infant normally has begun to develop an integrated vestibular system. This integrated vestibular system is the underlying basis for establishing normalized muscle tone. It provides the structure on which higher level developmental tasks occur. Proximal fixation of the upper extremity or scapula stability must be established prior to working on development of protective extension.

Purposeful voluntary sucking is a later development of the suckle/swallow reflex present at birth. These sucking skills further strengthen the muscles required for midline stability. As the suckle/swallow reflex becomes integrated into the more goal directed sucking skill, integration of other basic reflexes is occurring.

In order to prevent deformities these basic reflexes must be integrated. When the asymmetrical tonic neck reflex is not integrated deformities such as scoliosis and hip dislocation often occur.

Next, strong neck, trunk and hip extensors develop. This is exemplified in the pivot prone pattern.

The acquisition of these previous developmental milestones allows for the development of co-contraction of muscle groups which provide stability at the joints. As inversion maximizes the power of the extensors, activities for co- contraction are completed following inversion. Lastly, balance or equilibrium is developed. Righting reactions and protective extension are given attention at this time. Ultimately, the acquisition of the preceeding developmental tasks will yield such complex skills as walking and eye-hand coordination.

The following sequential activity charts are organized developmentally. The charts provide activities aimed at achieving these developmental goals and state the expected results.

CHART #1

Activities Aimed at Normalizing Muscle Tone

Activity	Effect on Muscle Tone	Developmental Result and/or With Whom to Use
I. **Spinning in hammock**	Increases Muscle tone	Offers evaluation of the integration of the vestibular system by observed nystagmus Fosters integration of vestibular system Stimulates vestibular system. Use with child who exhibits less than normal nystagmus. Use with hypotonic child *See Caution
II. Inversion A. On Lap B. On beachball C. On inversion board	Encourages the normalization of muscle tone	Offers vestibular stimulation to normalize muscle tone (gravity as stimulator to labyrinths) *See Caution
III. Rotation A. Prone B. Supine C. Side-lying D. Rolling E. Sitting	Breaks up abnormal spastic muscle tone in midline Develops rotational patterns	Use with child who displays spasticity Use with any child who lacks rotation. Use with hypotonic child

(continued on following page)

CHART #1
Page two

Activity	Effect on Muscle Tone	Developmental Result and/or With Whom to Use
IV. Abdominal kneading	Breaks up abnormal spastic muscle tone in mid-line	Stimulates more normal bowel activity Use with child who displays spasticity
V. Slow rolling on beach ball Prone	Decreases muscle tone	Use with hypertonic (spastic) child to relax • See Caution
VI. Bouncing A. On beach ball B. On trampoline C. On lap	Increases muscle tone	Stimulates proprioceptors for increased mid-line stability and encourages improved background postures such as sitting Use with hypotonic child

CHART #2

Activities Aimed at Integrating Basic Reflexes

Activities	Developmental Result
I. Prone A. Hammock B. Inversion 1. Beach ball 2. Lap 3. Inversion board C. T-Bar D. Scooter board	Encourages integration of: Asymmetrical tonic neck reflex Symmetrical tonic neck reflex Tonic labyrinthine reflex prone Encourages development of: Optical righting Parachute reaction or protective extension • See Caution
II. Supine A. Hammock B. Beach ball C. Scooter board	Encourages integration of: Asymmetrical tonic neck reflex Symmetrical tonic neck reflex Tonic labyrinthine reflex supine Encourages development of: Optical righting

CHART #3

Activities Aimed at Facilitating Desired Muscle Groups

Note: These techniques should not be done without specific recommendation and demonstration by a qualified therapist.

I. **Facilitation Techniques to Oral Mechanism:** This mechanism includes the child's lips, tongue, gums, and cheeks. Administer the following while the child's
(1) body is flexed,
(2) head is flexed, and
(3) jaw position is controlled. The jaw is controlled by placing your index finger directly along the crease of the chin, avoiding touching the lower lip, and middle finger under the chin behind the point of the chin along the tongue muscle.

When administering the following steps, the number of times each step is done will vary with each child depending on the severity of the problem.

Activity	Effect on Muscle Group
A. Using index finger, or the end of a toothbrush, in the middle of the side of the tongue, stimulate, shoving tongue from side to side	Stimulates tongue muscles Desensitizes tongue
B. Using your index finger or the end of a toothbrush, stimulate the middle of the tongue, beginning at the tip and walking backward. If gag reflex is hyperactive, begin closer to the front of the tongue and gradually walk back toward the middle as desensitization occurs. Walk back until tongue humps; **quickly** remove hand from mouth and allow swallowing	Facilitates swallowing response Desensitizes tongue Inhibits tongue thrust Normalizes hyperactive gag reflex Caution: If the child exhibits a bite reflex, do not use your finger.
C. Massage outside of gums, with your fingers	Desensitizes the gums
D. Using your thumb and index finger, grasp and stimulate inside of cheek working to midline of upper lip. After each stimulation, wait a few seconds, offering the child the opportunity to swallow	Stimulates lip closure and desensitizes cheeks
E. Repeat same as above except work toward midline of lower lip	Stimulates lip closure
F. Using fingers or a battery-operated vibrator, stimulate around lips. Alternate direction every other time	Stimulates lip closure Decreases drooling
G. Stimulate the outer cheek areas, working from corner of mouth upward to ear using a terry cloth or fingers.	Stimulates lip closure
H. Ice lips using popsicle. The popsicle should be the size of the mouth when puckering	Stimulates lip closure

I. Have child suck non-sweet liquid	Purposeful activity Caution: Sweet liquids and milk may increase drooling
II. **Inversion** A. Beach ball B. Lap C. Inversion board	Stimulates neck, trunk, hip and wrist extensors
III. **Joint approximation** A. To head B. When on all 4's 1. Down through shoulders 2. Down through hips C. To fingers of less involved hand D. Next, to fingers of more involved hand	Increases muscle tone thereby promoting co-contraction or stability around the joint Encourages circulation and bone growth Increases body awareness of that part
IV. **Rubbing with terry cloth** A. Trunk B. Extremities	Provides sensory stimulation Desensitizes hypersensitive skin under which weak muscles lie
V. **Platform shoes** A. Worn during waking hours whether weight-bearing or not B. Attached to prone board	Prevents stimulation to ball of foot thereby inhibiting total extension, scissoring, and plantar flexion
VI. **Standing on prone board** With platform shoes attached when appropriate	Provides weight bearing stimulation to bones and joints. Use if child lacks independent standing. Specifically, stimulates development of hip joint or acetabulum Provides desired lower extremity positioning Improves bowel and bladder functions
VII. **Standing box**	When used with children who have spina bifida and are wearing lower extremity bracing, provides weight bearing stimulation to bones and joints. Use if child lacks independent standing. Specifically, stimulates development of hip joint or acetabulum Improves bowel and bladder functions

CHART #4

Activities Aimed at Facilitating Co-Contraction

Activity	Effect
I. Following inversion, stimulate the neck flexors and extensors (prone-tucking chin) to facilitate co-contraction	Increases neck stability
II. Following inversion, stimulate trunk and hip flexors and extensors to facilitate co-contraction A. Folded up all 4's B. Flexion seat	Increases trunk and hip stability
III. Following inversion use the squat-stance board to facilitate co-contraction at ankles	Increases ankle stability

CHART #5

Activities Aimed at Developing Equilibrium

Activity	Developmental Result
I. **Prone positioning** A. Hammock B. Inversion 1. Lap 2. Ball 3. Inversion board C. Vestibular board	Encourages the development of righting reactions in prone by stimulating the development of the labyrinthine righting acting on the head, allowing the head to lift against gravity • See Caution
II. **Rolling** A. On floor B. Roll uphill on vestibular board C. Roll uphill on beach ball D. Resistive rolling	Stimulates the development of body righting acting on the body or segmental rolling using rotation • See Caution
III. **Prone positioning** A. Hammock B. Inversion 1. Lap 2. Ball 3. Inversion board	Stimulates the development of protective extension of arms forward • See Caution
IV. **Position in sitting** tilt to each side; tilt forward and back A. On floor B. In tip-n-rock chair C. On vestibular board D. On ball	Stimulates the development of protective extension of arms to the sides and forward and backward when sitting • See Caution
V. **Prone positioning** (tilt to one side, then tilt to the other side) A. On ball B. On vestibular board	Encourages the development of equilibrium reactions when prone • See Caution
VI. **Position in sitting** A. Sit-N-Spin ® B. On floor-tilt to each side C. On vestibular board-tilt to each side D. On ball-tilt to each side E. Play with weighted ball while on floor; as balance improves play with weighted ball while on vestibular board, then on ball.	Encourages the development of equilibrium reactions when sitting • See Caution
VII. **Position on all 4's** (tilt to one side, then tilt to the other side) A. On floor B. On vestibular board C. On ball	Encourages the development of equilibrium reactions when on all 4's • See Caution

VIII. **Position on knees** (tilt to one side, then tilt to the other side) A. On floor B. On vestibular board	Encourages the development of equilibrium reactions when on knees * See Caution
IX. **Position in standing** (tilt to one side, then tilt to the other side) A. On floor B. On vestibular board	Encourages the development of equilibrium reactions when standing

* Caution: These techniques should not be used with children who demonstrate cardiac problems, seizure activity, shunts, unarrested hydrocephaly, or other delicate medical problems unless recommended by the child's physician.

THINGS TO REMEMBER

The following suggestions have not specifically been covered in the body of the manual. It is felt their inclusion is necessary to provide a more complete understanding of DPM.

GENERAL

1. Do activities that affect muscle tone first, before positioning or working on movement patterns.
2. Do not force arms and legs into desired positions. Use facilitation techniques such as rotation to achieve the desired position.
3. Do not bounce children with spasticity on their tiptoes or while sitting on a beach ball as it will increase the muscle tone.
4. Creeping or movement on all 4's is not encouraged in all children. If flexor spasticity exists in the knees, crawling or pulling with the arms while on the stomach with the legs remaining straight should be encouraged.
5. Apply the "therapeutic use of self" which means adjust your personality to fit the needs of the child. For example, use a lower, calmer tone of voice with a child displaying athetosis who is easily excited.
6. Incorporate as many types of stimulation as possible. Examples:
   A. Name the directions such as backward, forward, or side-ways.
   B. Name the colors of the items, such as an **orange** ball.
   C. When dressing and undressing the child, name the parts of the body.
   D. While the child is inverted, place a visually and/or auditorily stimulating toy on the floor. If the child's level of functioning will permit, a bimanual manipulative toy should be made available to the child.
   E. Use behavior modification to achieve the desired positioning or movement patterns.

HANDLING

1. Tell the child what you are about to do.
2. Do not pick the child up under the arms.
3. Handle the child slowly.
4. Give as little support as is needed to be safe. Allow the child to provide as much postural stability for himself as possible.
5. Each child and his particular needs should dictate the way in which he is carried. Every child should not be carried in the same way!
6. Carry prone if the child lacks neck control. Place your arm between his legs if he has tight adductors or if his legs are very close together. Administer rotation if the child has spasticity.
7. If the child has a total extension problem, flex the neck, use rotation to bring the child to a sitting position, and carry in a sitting position. Avoid contact to the back of the head and to the balls and toes of the feet as stimulation to these areas often triggers total extension. Carry the child with knees flexed, legs abducted, and support provided under the heels.
8. When in a supine position, a child with spasticity should be set up before lifting him. He can be brought to a sitting position by flexing the neck, bringing the shoulders forward and bending him forward at the hips. (Refer to Number 7 above.)
9. Carry a child with athetosis in a sitting position, controlling the arm and leg movements. If the child with athetosis lacks neck control, carry him prone and inverted periodically. Refer to cautions in the inversion section on page 34.

POSITIONING

1. Change the child's position often. A good rule of thumb is to change the position every twenty minutes.
2. Strive for symmetry or straight alignment of the body in positioning and movement patterns.
3. **Prone:**
   A. Prone, in general, is a position to encourage.
   B. For a child who lacks neck and/or trunk control it stimulates head and trunk righting or lifting against gravity, thereby strengthening mid-line stability.
   C. A child who lacks scapula stability should be positioned frequently in the prone position, with the arms adducted at the shoulders. This position discourages extreme scapular abduction or round shoulders.
   D. Position the child prone over a wedge or a bolster to bring the arms forward. This multi-purpose position provides opportunity for eye-hand association.
4. **Supine:**
   A. In general, supine is a position to avoid unless recommended by the therapist who states a clearly defined purpose.
   B. The supine position when used in conjunction with a firm bolster under the base of the neck inhibits total extension. This technique prevents the back of the head from receiving stimulation which would otherwise cause the child's body to go into total extension.
5. **Side lying:**
   Side lying offers a stable position for children with athetosis. This position encourages adduction of the hips. In addition, it promotes flexion on the "up" side and extension on the "down" side.
6. **Sitting:**
   A. Discourage frog sitting or W sitting.
   B. Encourage long sitting.
   C. Encourage side sitting, alternating sides to foster symmetrical development.

D. Use of corner sitting provides needed stability for children who display athetosis or others who lack independent sitting skills but have sufficient trunk extension.

E. Encourage rotation by twisting the trunk off the hips in as many ways as possible. For example, while side sitting, place a toy to the child's side, stimulating the child to rotate his trunk in order to reach the toy. These rotational activities break up mid-line spasticity.

F. A child with spasticity needs the following components to be a part of his sitting position: knees slightly higher than hips, abduction at hips and feet flat on floor in platforms when appropriate.

TECHNIQUES AND EQUIPMENT:

To be used with . . .
Purpose . . .
Description . . .
How to use . . .
Goal . . .
Cautions . . .

INTRODUCTION TO TECHNIQUES AND EQUIPMENT

An attempt has been made in the following section of the manual to present each technique and piece of equipment used in the DPM program in a clear and concise manner. Each section begins by noting the physical characteristics of the children with whom the technique might appropriately be used. The purpose of the procedure is then stated and a brief description of the technique or piece of equipment is provided. Next, specific guidelines for the use of the technique are presented. This area discusses the actual "how-to's" in the use of DPM methods and equipment. The ultimate goal in using each procedure is given, and finally cautions when implementing the technique are noted.

It is hoped that the information given will be of valuable assistance in the proper use of DPM. However, the teacher should **not** employ these techniques without the recommendations and monitoring of a qualified therapist. She should be aware of the precautions when a particular technique or piece of equipment is being used. She should not hesitate to discontinue their use and consult the therapist if she questions the child's response.

As the teacher becomes more familiar with the techniques and equipment, she will become more adept at integrating these activities into the daily schedule. She will also find new and enjoyable ways of combining language development with proper positioning, academic tasks with sensory- motor activities, and she will learn the subtle hints that indicate that the end result is being achieved.

ROTATION

TO BE USED WITH: Rotation is used with children who have spasticity or too much muscle tone.

PURPOSE: Using rotation helps to break up mid-line abnormal spastic muscle tone, allowing the child more movement. Rotation should be the first activity of the morning and an unconscious part of all handling and positioning throughout the day.

DESCRIPTION: In hip rotation, the hips are moved in a swivel motion, producing movement at the waist. Trunk rotation is movement of the upper trunk in a back and forth twisting motion. Rotation done side lying is movement in the opposite directions of the upper part and lower part of the body.

HOW TO USE: Hip rotation is performed with the child lying on his back. The teacher holds the child at the upper part of the legs above the knees, encouraging but not forcing abduction at the hips. Each leg rests on the outside of the instructor's hand and she then moves the hips, as one unit, in a swivel motion.

In performing trunk rotation, the child is held in an upright position with the teacher's leg placed between the child's legs. The teacher, reaching across the child's chest, holds the child at the shoulder or under the arms. The other hand should hold the child at his waist or hips.

The teacher then gently moves the child's upper extremities and trunk from side to side, applying slight pressure in the opposite direction at the waist or hips.

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If the child is larger, the teacher may want to place him on his side on the floor. She should position one hand around his arm at the shoulder and the other hand on his hip.

The teacher then gently moves the upper part of the body in one direction and the lower part of the body in the opposite direction, moving both parts back and forth.

The child should then roll over to the opposite side and the procedure is repeated.

GOAL: Rotational activities should decrease the amount of spasticity and allow the child to be placed in positions in which he is better able to function.

CAUTIONS: Rotation should be done both to the right and left.

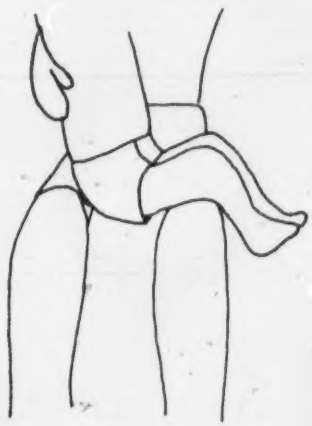
ABDOMINAL KNEADING

TO BE USED WITH: Abdominal kneading can be used with any child who lacks sufficient muscle tone or who has too much muscle tone.

PURPOSE: The purpose of this technique is to normalize muscle tone in the mid-line. It also helps regulate bowel functioning.

DESCRIPTION: Abdominal kneading is done with the child in a sitting, flexed position. The teacher uses her hand in a kneading motion on the child's abdomen.

HOW TO USE: With the teacher sitting in a chair, the child sits on her lap in a flexed position with the child's buttocks between the teacher's legs.



While supporting the child's neck with one hand, the teacher gently "kneads" the abdomen with the other hand. With the heel of the hand, she pushes gently toward the mid-line of the abdomen, then pulls toward the mid-line with the fingertips.

The motion is similar to that used in kneading bread. The heel moves from the outer side of the body to the mid-line of the abdomen while fingertips pull toward the mid-line.

GOAL: The normalization of muscle tone will be encouraged.

CAUTIONS: The child should always be in a flexed position when abdominal kneading is being done.

Gentle kneading is the key. Caution should always be taken to avoid hurting the child.

RUBBING WITH TOWELS

TO BE USED WITH: This type of activity can be used with any child. It is especially important with children who exhibit some paralysis.

PURPOSE: Rubbing with towels provides tactile stimulation, making the skin less sensitive. It also aids in increasing body awareness.

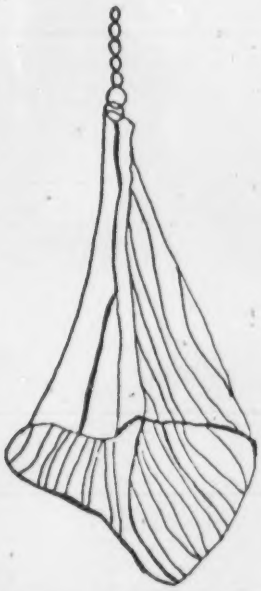
DESCRIPTION: Any type of terry cloth towel may be used.

HOW TO USE: Position the child in the therapeutic position of choice. The child's outer clothing is removed. The teacher then rubs the child's body briskly with the towel. If one part of the body is more involved, such as the legs of a child with spina bifida, that area is emphasized.

Talking to the child while he is being rubbed increases his awareness of his body. Name and talk about the body part being rubbed.

GOAL: Rubbing the body with towels should provide stimulation, increase body awareness, and desensitize hypersensitive skin to allow the muscles underneath to better function.

VESTIBULAR STIMULATION



TO BE USED WITH: Vestibular stimulation can be beneficial to any child whose vestibular system is not properly integrated, whether he is hypotonic or hypertonic. The vestibular system is considered the seat of muscle tone. The in-

tegration of this system is evaluated by turning the child ten turns in twenty seconds and observing the amount of nystagmus present. Nystagmus is the jerking horizontal movement of the eyes which is present following rotary movement, such as spinning. Six to fourteen seconds of nystagmus following rotary movement is considered normal. The specific procedure should be administered by a qualified therapist. The interested reader is directed to Dr. A. Jean Ayres' standardized test, the **Southern California Post/Rotary Nystagmus Test,** published by Western Psychological Services, 12031 Wilshire Blvd., Los Angeles, California, 90025. This procedure should only be attempted by qualified personnel. It is imperative that CAUTIONS be read.

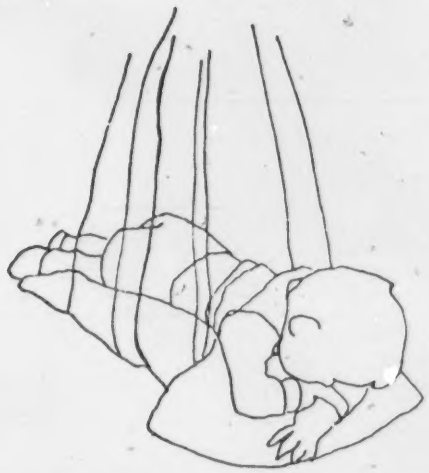
PURPOSE: Vestibular stimulation is an activity used to provide assessment of and stimulation to the vestibular system. It aids in the normalization of muscle tone. Integration of basic reflexes is encouraged thereby allowing higher level righting and equilibrium reactions to develop.

DESCRIPTION: Both ends of a hammock are suspended from a common point overhead. A pillow or padding of some kind should be placed in the hammock to provide greater comfort to the child.

HOW TO USE: If the child's vestibular system is found to be non-integrated, he should experience vestibular stimulation daily. Vestibular stimulation can be provided in many ways. One method is by rotary movement in a hammock. It is better to lower the hammock so that the child can reach the floor and turn himself. The amount of nystagmus observed is recorded on a chart.

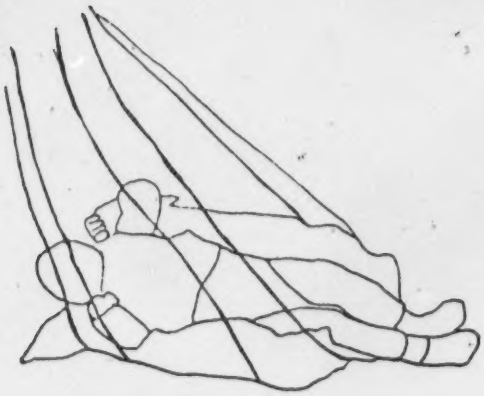
Most children are turned in the prone, supine, and sitting positions, both to the left and to the right.

Prone position: When turning in the prone position, the child is placed in the hammock on his stomach. The teacher turns the hammock in one direction. She then observes the amount of nystagmus and records it on the chart.



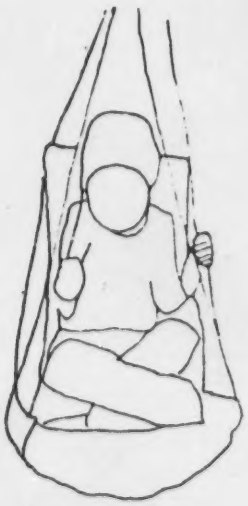
The child is then turned in the opposite direction and nystagmus is observed and recorded.

Supine position: The child is placed in the supine position in the hammock and the same procedure is followed. Nystagmus is again observed and recorded.



Sitting position: If a child lacks sitting balance, a flexion seat or floor sitter may be used. The child is turned in the sitting position in each direction and the amount of nystagmus is recorded.

Any response below six seconds or above fourteen seconds may be considered an abnormal response and may indicate a lack of integration of the vestibular mechanism. Again, the reader is referred to Dr. Ayres' work for more specific information.



GOAL: The aim of vestibular stimulation is to aid in integrating and/or stimulating the vestibular system. Muscle tone may become more normalized. Righting and equilibrium reactions develop signifying the integration of basic residual reflexes.

CAUTIONS: The assessment procedure should only be administered by a qualified therapist who then should closely monitor the vestibular stimulation.

Children with cardiac problems, seizure activity, unarrested hydrocephaly, shunts, or other delicate medical problems should not be spun unless recommended by a physician.

INVERSION

TO BE USED WITH: Inversion is used with children who display abnormal muscle tone, either too much or too little.

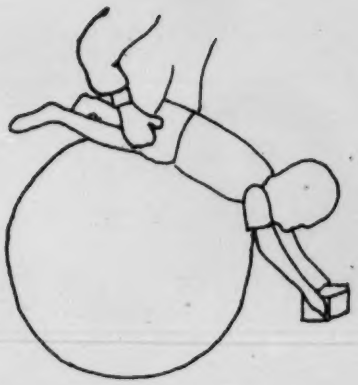
PURPOSE: Inversion aids in normalizing muscle tone. It stimulates, thus strengthens, the muscles which provide postural stability at the neck, trunk, hips, elbows, wrists, and ankles. Inversion can play a major role in integrating basic reflexes. As the child is encouraged to extend his arms and hands, parachute reactions are stimulated. This may be done by encouraging the child to reach for a toy when he is inverted.

DESCRIPTION: There are several possible methods of inversion. One such method is placing the child, in the prone position, over the teacher's lap with his head lower than his feet. A cage ball or large beach ball may also be used for inversion.

Another piece of equipment that is used to invert the child is the inversion board. This board somewhat resembles a rounded housetop supported by four legs. The surface is padded for comfort and straps are attached to the board for support. The height is determined by the child's measurements. It should be tall enough that the child's hands cannot touch the floor, but short enough for the child to reach a toy or activity placed on the floor or on a low table. The top of the board should be curved at an angle that will allow the head to remain lower than the rest of the body. The back portion of the top should be designed to allow the knees to rest in flexion.

HOW TO USE: When the child is inverted over the teacher's lap, he is placed on his stomach over her lap. The teacher straightens her leg on his head side so as to increase the angle of inversion. The child's head should be lower than his feet. A toy or activity should be placed within the child's reach.

The child may be inverted prone over the beach ball. The teacher should grasp the child at the hips and allow him to move forward until he can reach a toy or activity placed on the floor.



If an inversion board is used, the child is placed on the board and secured with straps which are attached to the board. These straps support the body at the shoulders and cross at the back. An appropriate toy or activity is placed within the child's reach.

Inversion should be done for short periods several times a day. Co-contraction patterns should follow.

GOAL: The child's neck, trunk, hip, wrist, and ankle muscles will be strengthened. Parachute reactions will develop and/or improve.

CAUTIONS: While the child is inverted, the teacher should be alert for flushing of the face. When flushing is observed, the child should be placed in an upright position until the redness disappears.

The child's position while inverted should be carefully monitored in an effort to maintain straight alignment.

Inversion should not be used with children who have shunts, heart conditions, epilepsy, unarrested hydrocephaly or other delicate conditions unless recommended by a physician.

CO-CONTRACTION PATTERNS *

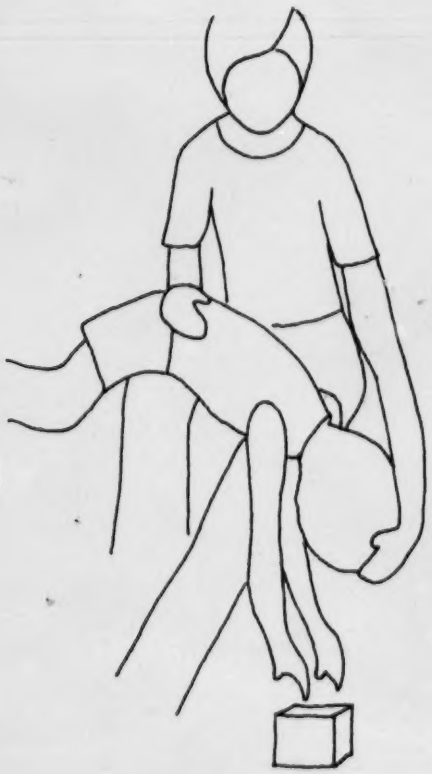
TO BE USED WITH: Co-contraction patterns are done following inversion. They are used with children who lack control at the neck, trunk, and hips due to spastic, athetoid, or general hypotonic conditions.

PURPOSE: The aim of these procedures is to stimulate contraction of the muscles around the mid-line joints, thereby encouraging mid-line stability.

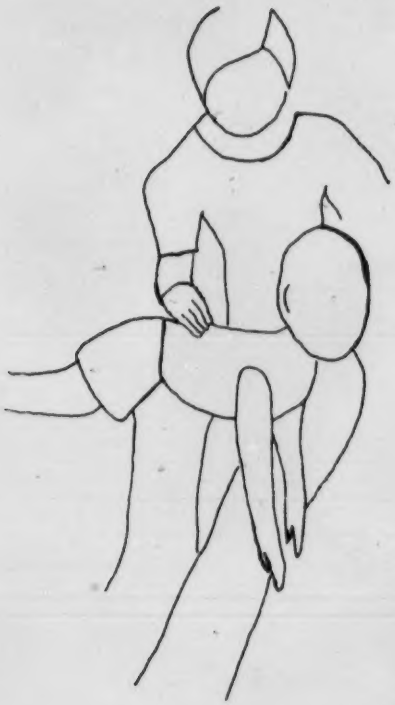
DESCRIPTION: Co-contraction patterns are positioning and movement patterns designed to increase the strength of the muscles used in maintaining posture.

HOW TO USE: To increase neck and trunk stability:

Following short periods of inversion the child is positioned prone and is encouraged to tuck his chin. A good technique is to position the child prone over the ball, using a visual target on the floor. Joint approximation is then applied through the neck joint by administering intermittent pressure to the top of the head. Make certain the head is in straight alignment with the trunk before performing joint approximation. Further information can be obtained in the joint approximation section.



This technique stimulates the development of neck and trunk co-contraction.



To increase trunk and hip stability:

Following short periods of inversion the child is placed prone in a folded up or "crouching" position. After he is in this position, he is encouraged to reach out with both hands, but not to bear weight on the elbows. A toy is placed or suspended in front of the child to encourage him to raise his head and trunk and to lean forward enough to grasp the toy with both hands. This pattern, which stimulates the child to gain stability at the trunk and hips, should be symmetrical. Achieving the folded up position is the point of emphasis, not the movement of reaching forward.

To increase ankle stability: Refer to the section on the squat-stance board.

GOAL: The aim of co-contraction patterns is to increase contraction of muscles around major mid-line joints, thereby increasing mid-line stability.

CAUTIONS: Incorrect use of these procedures can bring about undesired effects. Co-contraction patterns should not be done without the direction of a therapist.

* Due to the complexity of the theory underlying this technique, it should not be done without the supervision of a therapist.

VIBRATION*

TO BE USED WITH: Vibration is used with children who display weakness of a certain muscle or muscle group such as the extensors. The specific muscle to be vibrated should be determined by the therapist.

PURPOSE: The purpose of vibration is two-fold: (1) Vibration provides a method of desensitizing the skin. (2) It is used to stimulate a maintained contraction of weak muscles.

DESCRIPTION: Vibrators are available commercially. One type that is especially effective with smaller children is the hand-held, battery-operated type which has a rounded tip. Another type which provides stronger stimulation is an electric vibrator. Vibration is thought to be most beneficial when it is between 150 - 200 Hertz.

HOW TO USE: The specific muscles which are vibrated vary according to the child's particular disability.

When vibration is being used to strengthen neck and back muscles, position the child in inversion. The teacher should place one hand on the child's spine while holding the vibrator in the other hand. She then vibrates down each side of the spine, being careful not to vibrate the spine itself.

Vibration is done from the neck to the end of the spine.

The battery-run vibrator is especially effective in achieving bilateral hand play. The child is encouraged to hold the vibrator with both hands, thereby receiving vibratory stimulation. However, if vibration increases flexor spasticity in the hands, discontinue use.

This technique is sometimes used to strengthen muscles in the arms or legs. A therapist or physician should point out specific positioning, exact areas to be vibrated, and desired reactions for which to look.

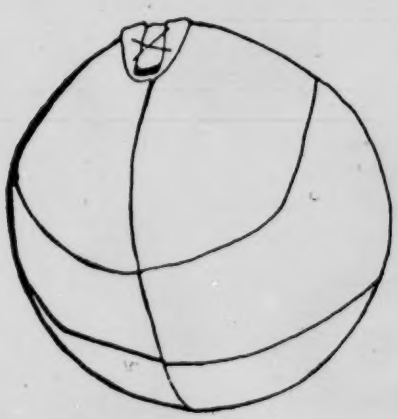
The vibrator is also an effective tool for desensitizing the heels before the child is placed on the prone board, squat-stance board, or in platform shoes.

GOAL: Vibration allows for increased stimulation and strengthening of weak muscles.

CAUTIONS: When used incorrectly, vibration can bring about undesired results, such as the strengthening of a muscle which already displays spastic tone.

* Vibration should only be done under the supervision of a therapist.

BALL



TO BE USED WITH: The ball can be used with almost any child. It is effective with children who have too much muscle tone or too little muscle tone. It may also be used with children who display greater involvement in one or more extremities.

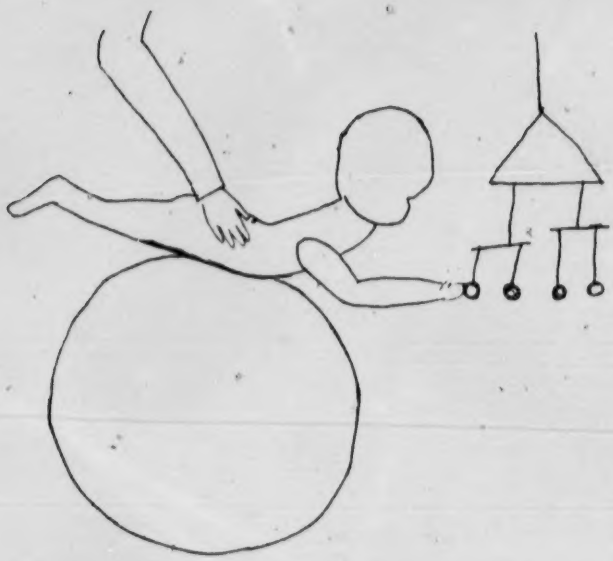
PURPOSE: The ball has several purposes. Neck, upper extremity, and trunk control are improved by placing the child on the ball on his stomach and slowly rolling him forward until his hands can reach the floor. This method of inversion aids in sensory integration and in the normalization of muscle tone when too much tone is present. It also encourages reflex maturation.

A child who is hypotonic may be bounced on the ball to increase muscle tone.

When the child is placed on the ball and tilted, righting responses are stimulated. Rolling the child back and forth on the ball when he is either on his stomach or back also improves righting responses. Rolling the child forward while on the ball specifically improves protective extension.

DESCRIPTION: A large ball is necessary, but the exact size depends on the size of the children with whom it is used. For infants, a ball approximately four feet in diameter or larger is appropriate. A cage ball or large beach ball may be used.

HOW TO USE: (1) To improve neck, upper extremity, trunk and hip control, and to lessen muscle tone, the child is placed on his stomach on the ball. The teacher grasps the child at his waist and slowly rolls him back and forth. She may roll the child forward and hold him in that position while he manipulates an appropriate toy placed on the floor. In addition, toys or mobiles should be suspended in front to encourage him to raise his head.



(2) If the child lacks sufficient muscle tone, he may be placed on his stomach on the ball. The teacher should grasp the child at the waist or hips and bounce him on the ball.

(3) If the child has sufficient trunk extension, the child is placed in a sitting position on the ball. The teacher holds the child at the hips, or if he has good trunk balance, at the top of the legs.

If the child is able, he may want to hold on to the teacher's arms or he may want to use his hands to balance on the ball. The teacher then bounces the child on the ball. Gradually, the child should be encouraged not to hold on to the teacher or the ball, but to extend his arms in space in an effort to balance.

If sitting balance is fairly well developed, the teacher may push the ball from side to side, encouraging the child to use his head, trunk, arms, and hands to right himself.

GOAL: Fast movement increases muscle tone. Bouncing the child on the ball while he is lying in a prone position should increase muscle tone.

If the child is rolled slowly on the ball while on his stomach, neck and trunk control should improve. Manipulating a toy while on the ball will also improve fine motor skills. Since slow movement decreases muscle tone, the child displaying spasticity could be slowly rolled while on a ball.

If a child is bounced while sitting on the ball, muscle tone will increase, thereby improving sitting ability. If he is moved from side to side, he should begin to use righting reactions to prevent himself from falling.

CAUTIONS: Using inversion with children who have shunts, heart conditions, epilepsy, and/or unarrested hydrocephaly or other delicate conditions warrants recommendation from the attending physician BEFORE administering the technique.

Children with spasticity should not be bounced on the ball. This movement will increase the undesirable muscle tone in these children.

When a child is on the ball in the prone or supine position with the head lower than the feet, the teacher should be alert for flushing of the face. The child should be brought to an upright position until the redness disappears.

JOINT APPROXIMATION

TO BE USED WITH: Joint approximation, or joint compression, is used with children who lack sufficient muscle stability around joints such as at the neck, shoulders, elbows, wrists, fingers, hips, knees, or ankles.

PURPOSE: Joint approximation provides stimulation to the proprioceptors. The proprioceptors are a group of receptors that respond to stimuli originating within the body. They are especially sensitive to pressure, position, and stretch. Firm pressure applied through joint approximation increases muscle tone, bone growth, circulation, and body awareness.

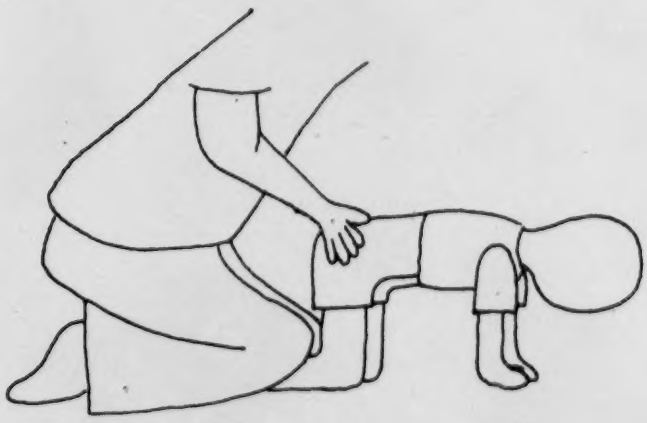
DESCRIPTION: In joint approximation, the teacher provides a gentle but firm intermittent pressure or pushing at the joint. This pressure can be applied at several points on the body.

HOW TO USE: When compression is appropriate at the neck joint, the child should first be stabilized in a prone and inverted position. The teacher then places her hand on top of the child's head and gently presses, releases, and presses intermittently.

When joint approximation is done at the finger, the teacher grasps above and below the joint to be stimulated. She then provides pressure back toward the hand, releases, and repeats. Each joint in the finger should be dealt with individually.

When joint compression is applied at the hip joints, the child can either be on all fours, kneeling, or standing, depending on his developmental level.

When on all fours, the teacher places her hands over each hip joint and applies downward pressure.



When the child is kneeling or standing, the teacher grasps the child at the hips and applies intermittent pressure down through the hip joints. The child may need to hold to a table or a stable object to maintain stability while in this position.

When administering joint approximation at the knee, the teacher places one hand on the child's knee and the other hand over the heel as the child lies on the floor. The leg is raised. As she keeps one hand on the knee, she gently applies downward pressure on the foot.

Pressure should be applied and then released; applied and then released.

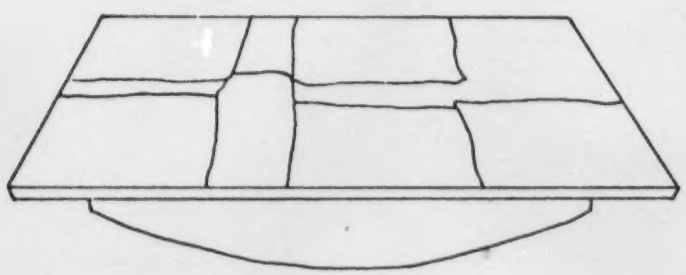
The same technique is repeated at other points as is necessary.

GOAL: The aim of joint approximation, or compression, is to increase muscle tone around the joint by providing stimulation to the proprioceptors which otherwise might receive a minimum of stimulation. Joint approximation increases bone growth, circulation, and body awareness.

CAUTIONS: Although firm pressure should be given, this technique should not cause pain. The joint or joints must be maintained in straight alignment. When working with the upper extremity in a weight-bearing position an **opened** hand, palm down, should be maintained.

Special caution should be observed when working with children with spina bifida. Because of their potentially brittle bones, joint approximation should be applied more gently.

VESTIBULAR BOARD



TO BE USED WITH: The vestibular board may be used with children with too much or too little muscle tone. It is used with those who have not developed righting and equilibrium reactions. It may be used with a child who has little or no use of one or more limbs. Use of the vestibular board is appropriate for children with disabilities ranging from undeveloped neck control and/or lack of sitting balance to those who can walk unassisted.

PURPOSE: The vestibular board aids in the integration of the vestibular mechanism. It is utilized to improve general righting and equilibrium reactions. Use of a more involved limb can be promoted by encouraging the child to take weight on that limb.

DESCRIPTION: The vestibular board is a rectangular piece of wood mounted on two arcs of wood which allow for a rocking motion. The top should be covered with carpet or some other durable material which prevents slipping and provides tactile stimulation. The size of the board can be determined by the size of the children using it and the amount of space available.

HOW TO USE: Use with children who lack neck control and/or sitting balance: The child is placed, prone or supine, on the vestibular board. The teacher rocks the board back and forth. She should keep her hand gently on the child to provide some stability and prevent slipping.

If the child was first placed on his stomach, he is then placed on his back and the procedure is repeated.

GOAL: The child will improve in his ability to lift his head and trunk control will increase. Righting and equilibrium reactions in prone and supine will improve.

CAUTIONS: The child should not be left on the board unattended.

HOW TO USE: Use with children who have neck control and sitting balance: The child sits on the vestibular board facing the teacher. He may either long sit, side sit, or sit Indian fashion; the teacher and therapist should decide which will be most effective, depending on the child's needs. The teacher then rocks the board, encouraging the child to extend his arms and balance himself.

The board should be rocked hard enough to keep the child slightly off-balance, but not hard enough to cause him to fall.

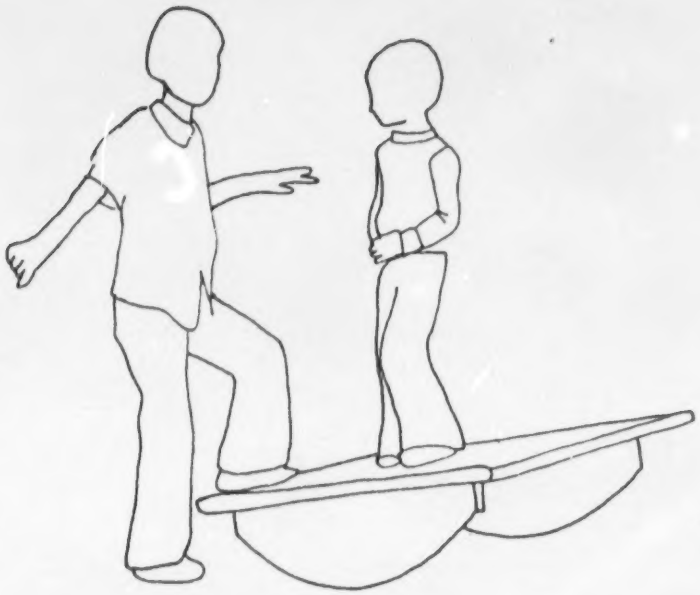
GOAL: The child will improve in protective extension responses. When sitting, he will reach out to prevent himself from falling.

CAUTIONS: The teacher should emphasize the development of protective extension to both the right and left, unless she is concentrating on the improvement of a more severely involved limb. Always begin working with the less involved side.

She should also be alert to keep the child from falling backwards or to the side.

HOW TO USE: Use with children who lack neck control and/or sitting balance: The child is placed, prone or supine, on the vestibular board. The teacher rocks the board back and forth. She should keep her hand gently on the child to provide some stability and prevent slipping.

The teacher might stand and encourage the child to hold her hand while she rocks the board with one foot.



As the child's balance improves, he should be encouraged to hold only one hand and finally, stand independently. The teacher will find the most comfortable position for herself and each child through experience.

When the child is standing, the teacher rocks the board back and forth causing the child to shift his weight in order to balance. The child should be able to hold on to the teacher's shoulders or hands for support and the teacher should be alert to take the child's weight if he loses balance. Gradually the child should gain independence in standing while demonstrating weight shifting reactions.

GOAL: The child will have improved balance when standing and walking.

CAUTIONS: The teacher should be careful to prevent the child from falling.

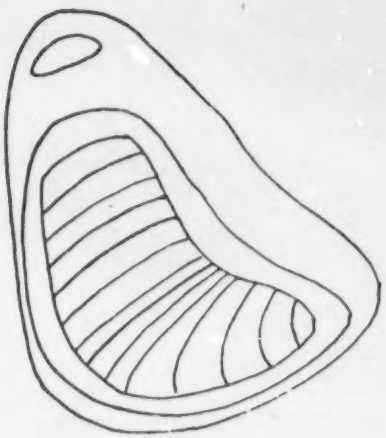
HOW TO USE: Use with children who have one limb that is more severely involved: Always begin work with the less involved side. Then, if the involved limb is an arm or hand, the child sits on the board and the teacher encourages the child to take weight on that side. The child may be reluctant to use that limb. The teacher may begin by placing one hand over the child's shoulder and her other hand over his hand, providing pressure as the weight shifts to that side. This maintained pressure offers the child weight-bearing stimulation. The teacher might lift the less involved hand off the board in an effort to encourage the child to use the other arm and hand. She should be careful not to support the child when using this procedure. The teacher might also rock the board slightly harder to the more involved side. For example, if the left arm is more involved, the teacher will lift the left side of the board higher, causing the child to lean on his left arm and hand. As the teacher gains more experience, she will find additional ways of encouraging the child to use the more involved side.

If the child needs to gain additional experience in bearing weight on a more involved lower extremity, he should stand on the board. The teacher then uses such methods as providing pressure down through the hip and to the top of the foot while she rocks the board, emphasizing rocking to the more involved side.

GOAL: The child should gradually gain increasing use of the more involved limb.

CAUTIONS: The teacher should not force a child to place weight on a limb which is not capable of bearing weight.

TIP - N - ROCK CHAIR



TO BE USED WITH: The Tip-N-Rock chair can be used with children who do not demonstrate protective extension by not reaching out to protect themselves from falling. The child should have neck and trunk control and should be able to sit in the chair.

PURPOSE: The chair is used to stimulate protective extension, such as parachute reactions, which is in the progression of balance development.

DESCRIPTION: The Tip-N-Rock chair is a small, curved, chair-like seat made of hard plastic. It sits on the floor and, because of the rounded bottom, tilts easily from side to side.

HOW TO USE: The child sits in the Tip-N-Rock chair. The teacher grasps the chair and tilts it back and forth and from side to side, encouraging the child to reach out to keep himself from falling. When the child protectively extends, the teacher should place one hand over the child's hand and with her other hand, give joint approximation down through the elbow. This maintained pressure offers the child the opportunity of internalizing the feeling of supporting himself.

A piece of foam may be placed in the chair if the child tends to slip. The foam may be fastened into the chair so that it goes across the seat and under the child's knees, maintaining the knees in a flexed position.

If the child exhibits more involvement on one side of the body, the teacher should work with the less involved side initially; she then should emphasize the use of the more involved arm and hand.

GOAL: The child should begin to reach out to prevent himself from falling. This activity should generalize so that the child will protect himself from falling when sitting alone.

CAUTIONS: Unless there is more involvement on one side of the body, the teacher should be careful to emphasize both sides. Protective extension to both sides should be developed.

SIT - N - SPIN ®

TO BE USED WITH: The Sit-N-Spin ® can be used with children who need to develop a stronger flexor pattern and who need to improve equilibrium reactions. Use of this piece of equipment requires that the child have good neck and trunk control, fair sitting balance, and use of the upper extremities.

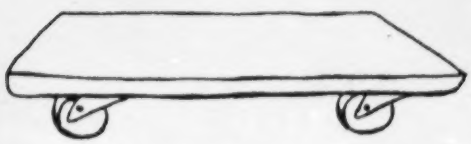
PURPOSE: Use of the Sit-N-Spin ® will aid in developing stronger abdominal flexors, a normal rotational pattern, and in improving righting and equilibrium reactions required in sitting, standing, and walking. In addition, it provides a simple motor planning task.

DESCRIPTION: The Sit-N-Spin ® can be ordered from the Sears' toy catalog. A large disc is loosely attached so that it turns to either side. A smaller stationary disc is attached to a post in the center of the base. It is made of hard plastic.

HOW TO USE: The child sits on the bottom disc with the legs crossed in Indian style. Holding to the smaller disc, the child turns himself using his arms and hands.

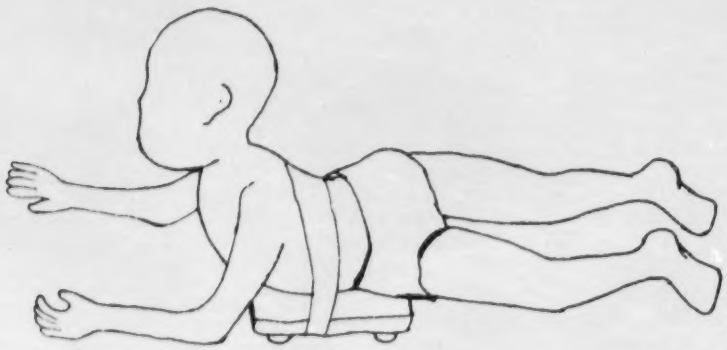
GOAL: As the child plays on the Sit-N-Spin ® ,abdominal flexors will become stronger, aiding in the development of equilibrium reactions.
CAUTIONS: The child should not be allowed to turn excessively to the left or right, but should be encouraged to turn in both directions.

SCOOTER BOARD



TO BE USED WITH: Scooter board activities can be used with any child who has fair neck control and enough control of his upper or lower extremities or both to propel himself. It can also be used with children who have no use of their lower extremities such as children with spina bifida.
PURPOSE: Using the scooter board in both the prone and supine positions encourages the integration of basic reflexes. Scooter board riding offers a simple motor planning task. Such activities aid in improving general sensory integration and overall body coordination. In addition, it serves as a method of transportation.
DESCRIPTION: The scooter board is constructed from a one-half inch thick plywood board with four casters attached to the bottom. The board is easily manipulated if the back casters are stationary and the front casters swivel. It should be covered with a piece of carpeting to provide tactile stimulation. The board should be short enough to allow the child to move his legs. A general rule is that the board should be a little wider than the child and as long as he is from under the arm to the hip bone. Scooter boards are also available commercially.
HOW TO USE: The child lies on the board on his back. In this position, he uses his legs. A child with spina bifida may propel the board with his arms. If the child has trouble staying on the board, he may need to be secured with some type of belt or strap, such as one that fastens with velcro.

When using the scooter board in the prone position, the child is placed on the board on his stomach. He may need to be secured on the board with a belt or strap across his back and under the board. The child should be encouraged to use his upper extremities to propel himself.



Children with spina bifida and other children who display paralysis of the lower extremities may be required by their disability to use this method.

If the child possesses very good sitting balance, he may sit on the board Indian style. In this position the child uses his upper extremities to pull himself along. Poles may also be utilized by the child in this position to propel himself.

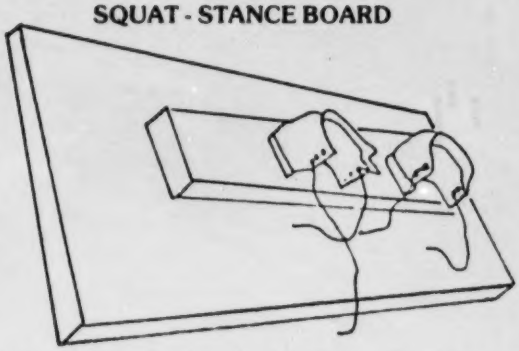
The teacher should use her imagination in finding activities, races, and games which incorporate the scooter board.

GOAL: Scooter board activities will aid in integrating basic reflexes and in improving basic body control.

CAUTIONS: Poor movement patterns should not be perpetuated. An example of such a pattern is one in which a child uses spastic muscle tone to move.

Caution should be taken to prevent the child from rolling over his own hands.

SQUAT - STANCE BOARD



TO BE USED WITH: The squat-stance board is used with children who exhibit spasticity in the lower extremities causing them to point their toes or demonstrate plantar flexion. Due to this disability, these children lack sufficient balance for proper standing and walking, and, therefore, develop inappropriate movement patterns such as the crouch gait and toe walking.

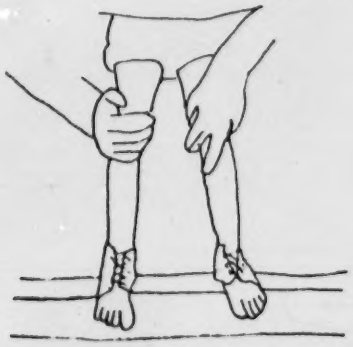
PURPOSE: Use of the squat-stance board helps in developing postural stability or co-contraction at the hips, knees, and ankles. It strengthens the joints and postural muscles necessary for standing and walking.

DESCRIPTION: The board consists of the heel portion of two shoes attached to a 2 inch x 4 inch block of wood. This block is attached to a large piece of one-half inch thick plywood to provide stability. The heels should preferably be from high top shoes in order to give more support at the ankles. The block of wood should be high enough to prevent the child's toes from touching the floor when he is placed in the shoes. In addition, a strap which is padded with foam on the inside may be used. It fits across the front of the ankle and fastens to the back of the wooden platform. This strap maintains the heel of the foot flat down in the heel of the shoe.

HOW TO USE: The child should be inverted before he does squat-stances. While the child is sitting on a small bench or stool or simply squatting, his feet are placed in the shoes. The teacher kneels or sits behind the child. She supports the child by placing her hands above and on his knees.

The teacher applies gentle pressure down through the knees as the child begins to stand. As he begins to stand, the teacher should watch the child's toes. The child should continue to rise as long as the toes do not drop.

At the point the toes begin to drop, upward motion of the child's body should stop.



At this point, the child goes back down into a lower squat position and repeats the squat-stance activity. The number of squat-stances should gradually increase.

The squat-stance board is quite effective as a positioning agent while the child is at his desk, eating, or participating in other similar activities. The child's feet are placed in the board; the board is then placed on the floor as the child sits in a chair. Adjust the height of the chair so that the knees are slightly higher than the hips.

GOAL: The child's postural stability at the hips, knees, and ankles will improve.

CAUTIONS: Each time before using the squat-stance board, desensitization techniques should be administered to the heels. These techniques include vibration, moderate pounding, and pinching lightly.

Upward movement should be stopped at the point the feet or foot drops below neutral. If, when from the squat position, he starts to stand, the feet or foot is below neutral, upward mobility should not be continued. For a short time simply provide the squat position without upward movement. This position provides stimulation to the heels in an effort to reduce the downward position of the feet or foot.

The quality, not the quantity, of the stances is important.

PLATFORM SHOES

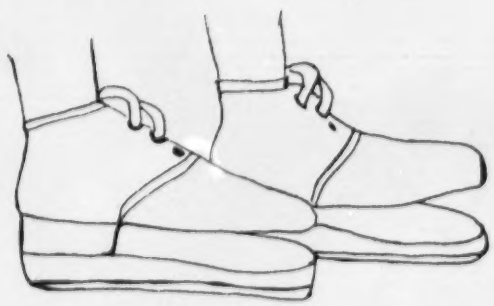
TO BE USED WITH: Platform shoes are used with children who display spasticity in the lower extremities. They may also be attached to a prone board for use when the child is standing on the prone board.

PURPOSE: The shoes should remove all pressure from the balls of the feet. Any pressure to this area of the foot stimulates the gastrocnemius, triggers a spastic response bringing the child to his tiptoes, and brings in muscles that cause the leg to be rigid. By removing this pressure or stimulation to the balls of the feet and providing pressure to the heels, the gastrocnemius is inhibited, allowing the child to develop the ability to stand with improved posture.

DESCRIPTION: The sole of a regular shoe, preferably a high-top shoe to provide more support at the ankle, is cut away from the arch seam out. The remainder of the shoe is attached to a wooden platform shoe. The heel of the platform is raised so that the ball of the foot does not touch any surface.

HOW TO USE: The shoes are used when a child exhibits spasticity in the lower extremities causing him to point his toes in a total extension pattern. The child wears the shoes during the waking hours. The shoes should be worn even though the child is not yet standing. If the child is using a prone board, he should wear the shoes then. He could wear them at any time when he is walking, even if he is using a walker or poles.

The child should begin wearing the shoes for short periods of about 5 minutes several times a day. The wearing time is gradually increased to develop a tolerance for the shoes.



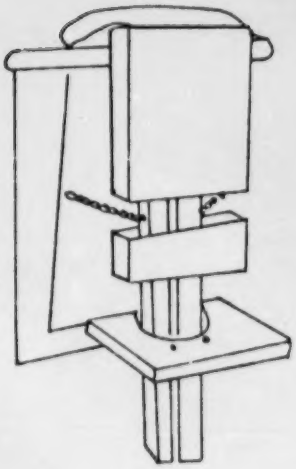
GOAL: The ultimate goal is for the child to walk with more normal posture. The child's posture should gradually improve as he is wearing the shoes and as the amount of walking increases.

CAUTIONS: Each time before putting platform shoes on a child, desensitization techniques should be administered to the heels. These include vibration, moderate pounding, and pinching lightly.

The child should not be encouraged to walk until neck and trunk control are developed.

While the child is wearing the shoes, the teacher should continually check for their proper fit. Watch for pressure points indicated by redness. If a toe bar is used, a frequent check should be made to be certain the toes are on the bar. The teacher should also make sure the toe bar does not touch the ball of the foot. The toe bar will need to be moved forward as the child's foot grows.

PRONE BOARD



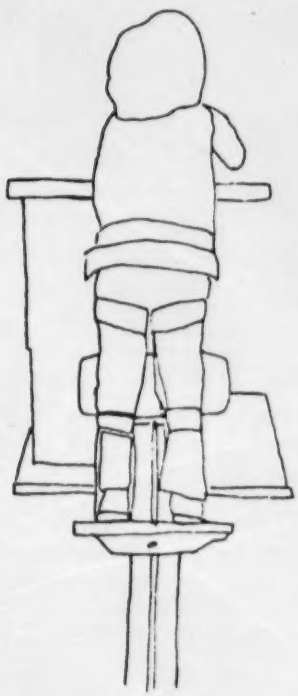
TO BE USED WITH: The prone board can be used with a child who is not able to stand independently. It may be used with children who have spina bifida, but only if lower extremity braces are worn.

PURPOSE: Use of the prone board provides weight-bearing stimulation to bones and joints, specifically to the development of the hip joint or the acetabulum. It improves circulation, respiration, digestion, and bowel and bladder functions.

DESCRIPTION: The prone board is constructed from one long piece of wood with padded supports for the chest and knees. This board is placed against some stationary object, such as a table, at a slightly forward, leaning angle. The prone board should be secured to the table to prevent it and the child from falling. Platform shoes may be attached to the prone board.

HOW TO USE: The child's feet are placed in the platform shoes to decrease standing on tiptoes. The child leans against the chest support and is secured around the trunk and/or hips with a safety belt of some type. This belt may be fastened with velcro. An activity to improve academic, eye-hand coordination, or fine-motor skills is placed on the table.

If the board is to be used with a child with spina bifida, the child should be wearing lower extremity braces. Platform shoes are not attached to the prone board used by a child with spina bifida. The child is positioned on the board and secured around the waist and/or hips with a strap or belt. While standing, the child should have some type of activity on the table. The activity will be dependent on his developmental level.



The child should begin by standing on the board for a short period. This time should be gradually increased as the child's tolerance of this new position increases.

GOAL: The child is given experience in an upright position and is provided a time for proper positioning of the lower extremities while weight-bearing.

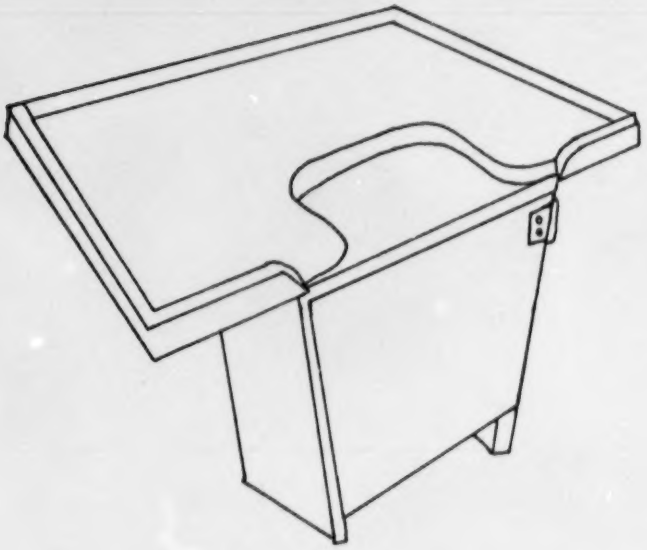
CAUTIONS: The teacher should carefully watch the child's position while he is standing in the prone board. When the child begins to slump, an indication that postural muscles are weakening, he should be removed from the board. Thereafter, the time period should be reduced and gradually built up again.

If platform shoes are attached, their fit should be closely monitored. The child's legs should be straight.

The teacher should also be certain that, by using some type of strap or belt, the child is securely fastened when standing.

The child should always be provided with an appropriate table activity while standing on the prone board.

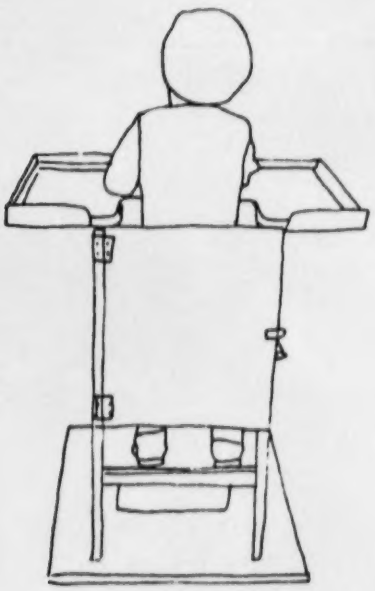
STANDING BOX



TO BE USED WITH: The standing box is used with children who display paralysis in the lower extremities and are wearing long-leg braces. An example is a child with spina bifida.

PURPOSE: The standing box is used to provide practice in weight-bearing in an erect position. Placement in this position also improves circulation, respiration, digestion, and bowel and bladder functioning.

DESCRIPTION: The standing box is a large wooden box-type structure which should be about as tall as the child's waist or slightly taller when the child is placed in the box. There is a door on the back of the box which can be fastened securely from the outside. The top of the box or table is large enough to accommodate an activity for the child and preferably has a low rim around the edge to prevent objects from dropping to the floor. The bottom of the box may be adjustable so that it can be used with children of different sizes.



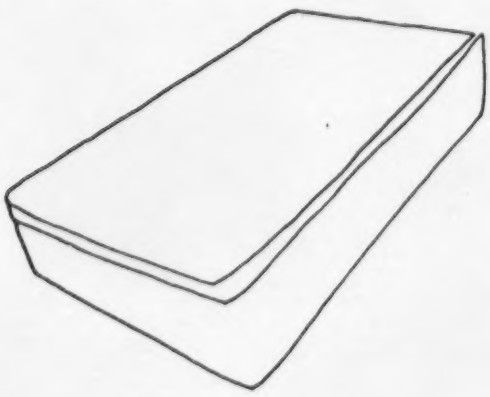
HOW TO USE: The child, when wearing long-leg braces, is placed in a standing position inside the standing box. An appropriate activity for the child is placed on the table. This activity could be a toy to improve fine motor skills or an academic task. The child begins by standing for a short period, gradually increasing the time for standing.

GOAL: Use of the standing box gives the child experience in a standing position and improves respiration, circulation, digestion, bowel and bladder control.

CAUTIONS: When braces are worn, the teacher should be cautious of pressure or redness caused by the braces.

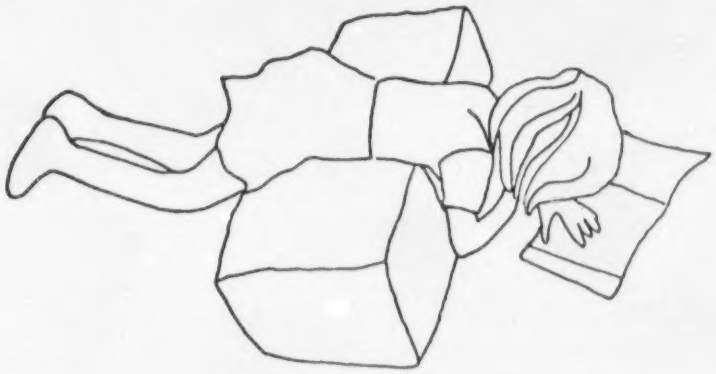
She should also judge carefully the length of time the child spends standing in the box. When the child begins to slump, an indication that postural muscles are weakening, he should be removed from the box. The child should always have some meaningful activity while standing in the box.

WEDGES AND BOLSTERS



TO BE USED WITH: Wedges and bolsters are used with any child who needs assistance in maintaining a desired position.

PURPOSE: Wedges, bolsters, and other such devices are used as positioning aids. Placement in a certain position can encourage proper development; for example, placing the child over a wedge can aid in the development of neck control.
DESCRIPTION: Positioning aids can be bought commercially, or foam shapes can be bought in department stores. They are available in many sizes and shapes, including round, rectangular, and angular. If a particular size or shape is desired, a hand saw or electric knife may be used to cut the foam. Plastic or cloth may be used to cover them to insure cleanliness and durability.
HOW TO USE: The uses of wedges and bolsters are limitless. The child may be placed in the prone position on the wedge with his arms outstretched and a toy or activity placed within reach.



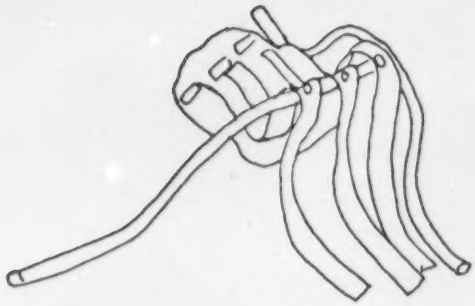
This position aids in the development of neck and trunk control. Placing a toy near the child encourages the development of eye-hand coordination and the use of fine motor muscles.

If the child's legs adduct or scissor, a small bolster might be placed between his legs. However, the legs should not be forced apart to achieve this separation; rather rotation should be used to achieve the desired range of motion. This bolster placement maintains the legs in a more normal position, allowing more space between them. When the child has progressed to balancing on his knees, the bolster can be used in the same way, helping to keep the legs apart.

If the bolster is large enough, it can be used for inversion. In this situation, the bolster is used in place of the large cage or beach ball.

A bolster can be used to place the child in a sitting position. He sits straddling the bolster, maintaining the legs in an abducted position. The teacher can then gently move the bolster to provide stimulation to the development of trunk balance. It should be remembered that a child with poor trunk extension should not sit as a position of choice. He should lie prone as much as possible.
GOAL: Wedges and bolsters will help to keep the child in a desired position. This positioning will encourage more normal development and help prevent contractures and deformities.
CAUTIONS: The teacher should continuously check for straight alignment when using positioning aids. The child should not be left to assume abnormal positions.

T-BAR



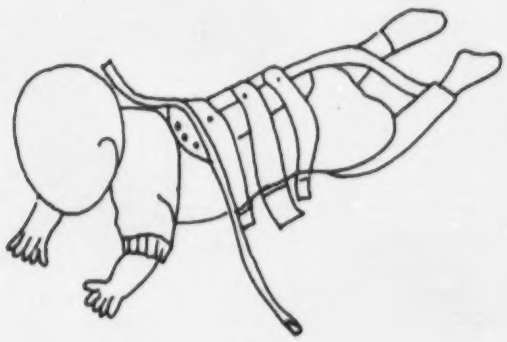
TO BE USED WITH: The T-Bar is used with children who prefer a supine position; with those who, when placed on their stomachs, roll onto their backs; or with those who frog or "W" sit.

PURPOSE: The T-Bar maintains the child in the prone or all-4's position. This position on the stomach stimulates the development of neck and trunk control. The development of crawling and creeping motions is encouraged by the positioning provided by the T-bar. The design prevents the child from assuming the abnormal and detrimental position of frog sitting.

DESCRIPTION: The T-bar is made of a metal or plastic pipe which fits down the child's back from the point between the shoulders to the end of the spine. This bar then curves down to the floor forming a foot for stability. It should extend 4-6 inches longer than the legs. The second bar fits across the back between the shoulder blades and waist. It also curves down to the floor forming a foot on each side for stability. Straps are attached to the vertical bar and fastened around the child at his upper trunk and between the waist and hip bones.

HOW TO USE: The T-bar is placed on the child's back, following the contour of his spine. Straps attached to the apparatus are fastened around the child's upper trunk and between the waist and hip bones. The child is then encouraged to move about while he is in the prone position.

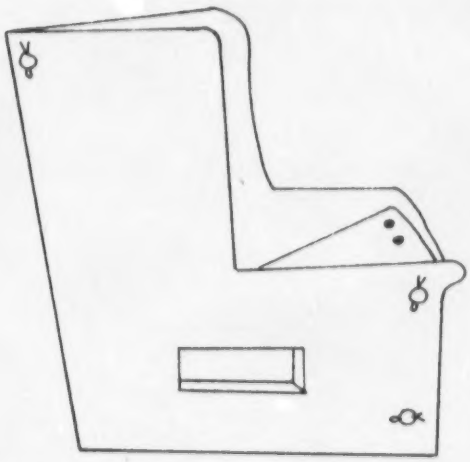
Begin with a short wearing time. Gradually increase to longer wearing periods.



GOAL: The child's neck and trunk control will improve. Crawling motions may increase. Frog sitting will be prevented.

CAUTIONS: The fit of the T-bar should not restrict crawling motions, such as when the lower strap prevents leg movement.

FLEXION SEAT



TO BE USED WITH: The flexion seat can be used with children who have strong extensor muscle tone or with children who lack sufficient muscle tone to provide proper sitting balance. When a good sitting posture is required, especially for those who lack sitting balance, the flexion seat is quite effective.

PURPOSE: When the child is placed in the seat, the neck, trunk, hips, and knees are maintained in a flexed position. This position stimulates trunk and hip co-contraction. The built-up sides of the chair help the child to bring his hands together in a more functional position, thus encouraging eye-hand association. The position provided by the seat stimulates the necessary muscles for sitting balance in hypotonic and hypertonic children.

DESCRIPTION: The seat is shaped like a box with a bar in front over which the knees fit. The sides of the chair support the shoulders and arms. The seat itself, made from vinyl or a similar material, is suspended like a sling between the back of the chair and the knee bar. The sides and knee bar of the chair are padded.

HOW TO USE: The child should be inverted before he is placed in the flexion seat. He is placed in the chair in a sitting position with the knees flexed over the padded knee bar. He may be given an activity such as a toy which requires manipulation. The seat provides a good position for the child when function could be improved by placing him in a sitting position, such as when eating. It must be remembered that eating, when possible, should be done in a flexed or sitting position.

When appropriate, the child should wear platform shoes when he is sitting in the box seat to prevent the balls of the feet from receiving stimulation and causing extensor thrust.

GOAL: The flexion seat places the child in a good sitting position that he might not otherwise be able to achieve.

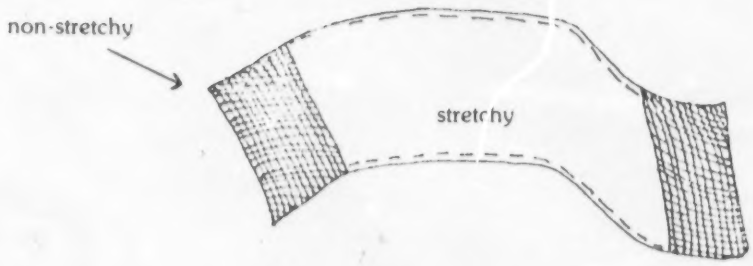
CAUTIONS: If the back of the chair is too high, it may touch the back of the child's head, causing him to extend.

The teacher should make sure the child is sitting straight in the chair and not slumping to either side.

The knee bar should be padded and fit properly so as not to restrict circulation at the knee joints.

It must be emphasized that sitting is not therapeutic to the development of neck and trunk control. On the contrary, it is detrimental. With a child who lacks neck and/or trunk control, sitting should only be done when it is the position of choice for the present activity.

ORTHOKINETIC CUFF



TO BE USED WITH: The orthokinetic cuff is used with children who are more severely affected on one side of the body than the other and/or for those who display wrist drop.

PURPOSE: The purpose of the cuff is to provide a more functional position of a limb.

DESCRIPTION: The cuff is constructed from a piece of elastic. The elastic is folded so that the middle is two thicknesses and each end is four thicknesses of bandage reduced of its elasticity by zig-zag stitching. Pieces of velcro are sewn on each end to fasten the cuff on the limb.

HOW TO USE: The elastic part of the cuff which should be two thicknesses is placed over the muscle to be stimulated. When the cuff is used on the arm, the two bones on the top of the arm are located and the stretchy part of the cuff is placed over that area. It covers the area from the inside bone to the outside bone and is placed about one inch below the elbow. After it is fastened, the teacher should be able to put two fingers under the cuff.

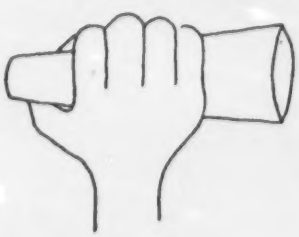
The cuff should be worn during all waking hours and removed at night.

GOAL: Use of the orthokinetic cuff will provide more functional use of the limb.
CAUTIONS: The cuff should be made by a therapist. It should not be too tight. The teacher should make sure it is in the correct position and does not shift positions.

The teacher should be aware that the effect will not be immediate.

CONES

TO BE USED WITH: Cones are used with children who exhibit spasticity in the upper extremities and consequently hold their hands in a clenched-fist position.
PURPOSE: The cone helps position the fingers so that they may function more adequately after the cones are removed.
DESCRIPTION: Cones that are used in yarn factories as the spool around which thread or string is wound are appropriate or a cone may be made from heavy cardboard.
HOW TO USE: The cone is placed in the palm of the hand. The small end is toward the thumb side of the hand. The thumb circles around the cone and is positioned opposite the index and middle fingers.



A strip of tape may be placed across the top of the hand over the knuckles to secure the cone. The extra length of cone at either end may be removed. The therapist should judge which size cone is suitable for the child's hand.
GOAL: Use of the cone should help the child to use his hand more functionally by inhibiting the spastic flexors.
CAUTIONS: This procedure should not be used to the exclusion of other methods which assist the child in gaining more use of his hands.

TUBING FOR DRINKING

TO BE USED WITH: Tubing should be used with any child who has poor sucking ability. It is especially valuable for use with children who have cerebral palsy, and who very often lack control of the muscles used in sucking.

PURPOSE: Tubing is used to develop and improve the ability to suck. The development of sucking will aid in the development of postural control, specifically neck and trunk control. In addition, it is a prerequisite for the development of speech.

DESCRIPTION: Clear plastic tubing can be bought in a hardware store. It can be bought in varying diameters and cut to the desired length.

HOW TO USE: The child should begin with tubing which is short in length and approximately 3/8" in diameter. The liquid to be ingested should be thin or the consistency of water or fruit juice. As the child's sucking improves, he should begin to develop resistive sucking skills by using either tubing which is smaller in diameter and longer or tubing which is larger in diameter and longer. With longer tubing, a thick liquid such as a milk shake should be used. This thick liquid will further develop resistive sucking. Eventually the child should be able to suck thicker substances such as applesauce or pudding.

For greater convenience, the tubing may be anchored to the side or top of the table with masking tape. One end of the tubing is placed in the cup with the other end free for drinking.

GOAL: The goal is for the child to be able to successfully use longer and more narrow pieces of tubing. In addition, thickness of the liquid should increase.

CAUTIONS: The use of tubing to develop the ability to suck should not cause the exclusion of the development of other self-help skills, such as drinking from a cup unassisted.

Tubing should be sterilized after each use.

APPENDIX

Theory Underlying the "Tonic Labyrinthine Inverted Position"
"Development of Balance in Terms of Reflex Maturation"
Glossary

THE TONIC LABYRINTHINE INVERTED POSITION

The management programs designed by and used in our programs are developmentally oriented. Development of neck control receives emphasis before the development of sitting balance because in the normal developmental sequence, neck control is established before sitting balance. Ms. Margaret Rood, through her neuro-physiological techniques, offers the most effective positioning technique for an infant who has cerebral palsy. The tonic labyrinthine inverted position is the most efficient position to stimulate the extensor group of muscles. Commonly, the extensor group is the more deficient muscle group in the vicious muscle imbalance observed in children who have cerebral palsy. The extensor muscle group is the more tonic or subject to longer contraction periods and consequently is responsible for background postures such as sitting. Neck and trunk control is an integral component of all background postures. Typically, infants with cerebral palsy have an existing muscle imbalance consisting of the flexor muscle group dominating the weaker extensor group, resulting in phasic movement patterns of flexion, adduction, and internal rotation. As a result, neck and trunk control are typically absent. Thus, it becomes obvious why the neuro-physiological soundness of the inverted position dictates it to be the position of choice as it encourages the very basic component lacking in the infants who have cerebral palsy.

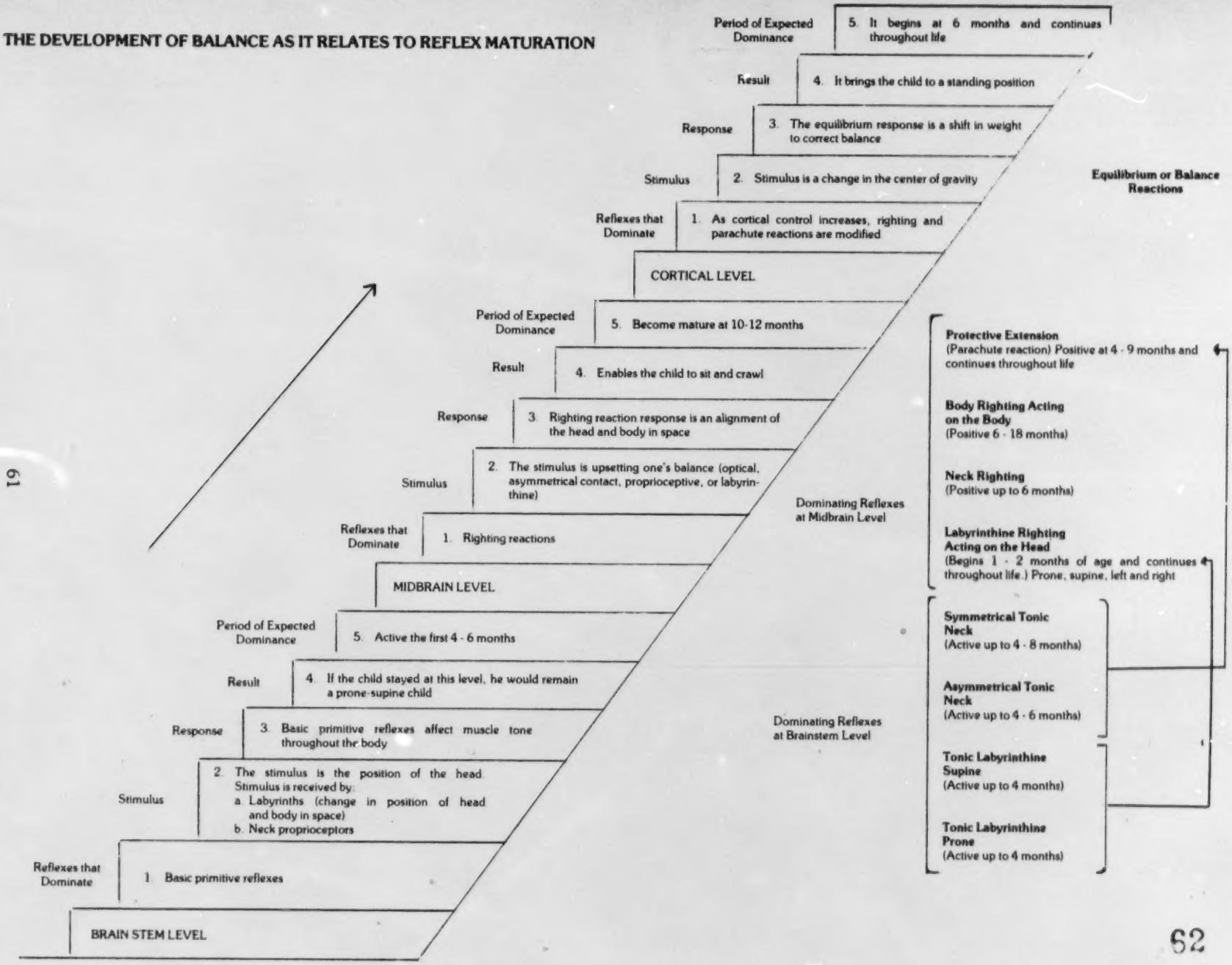
THE DEVELOPMENT OF BALANCE IN TERMS OF REFLEX MATURATION

The development of balance is related to reflex maturation. Reflex maturation is contingent on neurological growth and development. At the brain stem level, the infant is dominated by basic primitive reflexes. These basic reflexes are as follows: Tonic Labyrinthine Prone, Tonic Labyrinthine Supine, Asymmetrical Tonic Neck, and Symmetrical Tonic Neck. At the mid-brain level, anti-gravity reactions begin to emerge. These emerging reactions are as follows: Labyrinthine Righting Acting on the Head, Neck Righting, Body Righting Acting on the Body, and Protective Extension. As the child neurologically develops, the cortical level begins to dominate and ultimately yields a mature balance system.

The following chart lists the levels of central nervous system dominance. Each level depicts the following as it relates to reflex maturation:

Reflexes that dominate
Stimulus to elicit response
Response to stimulus
Results
Period of expected dominance

THE DEVELOPMENT OF BALANCE AS IT RELATES TO REFLEX MATURATION


Period of Expected Dominance
5. It begins at 6 months and continues throughout life
Result
4. It brings the child to a standing position
Response
3. The equilibrium response is a shift in weight to correct balance
Stimulus
2. Stimulus is a change in the center of gravity
Reflexes that Dominate
1. As cortical control increases, righting and parachute reactions are modified
CORTICAL LEVEL
Equilibrium or Balance Reactions
Period of Expected Dominance
5. Become mature at 10-12 months
Result
4. Enables the child to sit and crawl
Response
3. Righting reaction response is an alignment of the head and body in space
Stimulus
2. The stimulus is upsetting one's balance (optical, asymmetrical contact, proprioceptive, or labyrinthine)
Reflexes that Dominate
1. Righting reactions
MIDBRAIN LEVEL
Dominating Reflexes at Midbrain Level
Protective Extension (Parachute reaction) Positive at 4 - 9 months and continues throughout life
Body Righting Acting on the Body (Positive 6 - 18 months)
Neck Righting (Positive up to 6 months)
Labyrinthine Righting Acting on the Head (Begins 1 - 2 months of age and continues throughout life.) Prone, supine, left and right
Period of Expected Dominance
5. Active the first 4 - 6 months
Result
4. If the child stayed at this level, he would remain a prone-supine child
Response
3. Basic primitive reflexes affect muscle tone throughout the body
Stimulus
2. The stimulus is the position of the head. Stimulus is received by:
a. Labyrinths (change in position of head and body in space)
b. Neck proprioceptors
Reflexes that Dominate
1. Basic primitive reflexes
BRAIN STEM LEVEL
Dominating Reflexes at Brainstem Level
Symmetrical Tonic Neck (Active up to 4 - 8 months)
Asymmetrical Tonic Neck (Active up to 4 - 6 months)
Tonic Labyrinthine Supine (Active up to 4 months)
Tonic Labyrinthine Prone (Active up to 4 months)

GLOSSARY

Terms of position:

Superior - Nearer the head
Inferior - Nearer the feet
Anterior - Nearer the front of the body
Posterior - Nearer the back of the body
Ventral - Front of trunk or abdominal surface
Dorsal - Pertaining to the back of any part of the body
Palmar - Pertaining to the palm
Plantar - Pertaining to the sole surface of the foot
Midline of the body - An anatomical point of reference - an imaginary vertical line which splits the body exactly in half
Medially - Closer to the midline of the body or pertaining to the middle
Laterally - Pertaining to the side
Superficial - Nearer the skin
Proximal - Nearer to midline
Distal - Farther from midline
Supine - Lying on back
Prone - Lying on stomach

Terms of movement:

Flexion - Bending
Abduction - Movement away from midline
Adduction - Movement toward midline
Pronation - Rotate hand or forearm so as to bring palm facing downward
Supination - Clockwise rotation of hand or forearm, palm facing upward
Internal rotation - Rotation toward midline
External rotation - Rotation away from midline
Dorsi-flexion - Movement of foot so as to point the toes upward
Plantar-flexion - Movement of foot so as to point the toes downward
Equinovarus - A congenial deformity known as clubfoot. The foot is turned downward and inward.
Crawling - Prone movement on stomach
Creeping - Movement on all 4's
Active movements - Those movements a child does without help
Assistive movements - Those movements a child does with help
Passive Movements - That which is done to the child without his help
Sensory-motor patterns - The ways in which the body and limbs work together to make movement possible
Sensory-motor experience - The feeling of one's own movement
Posture - Position from which the child starts to move

Areas and Bones of the Body:

Axilla - Under the arm
Scapular region - Area around the shoulder blades
Pectoral region - Front of the chest
Shoulder girdle - The skeletal structure providing for attachment of the bones of the arms to the rest of the body including the scapula or shoulder blades and the clavicle or collar bone

Sternum - Breast bone
Humerous - Upper arm bone
Forearm - Extends from elbow to wrist
Radius - The shorter bone of the forearm located on the thumbside
Ulna - The longer bone of the forearm located on the little finger side
Carpal bones - The eight bones in the wrist
Matacarpal bones - Five bones in the hand, corresponding with the five fingers
Phalanges - Bones of the fingers or toes
Pollex - Thumb
Trunk - Body
Gluteal region - Hip and buttocks
Pelvic Girdle - The skeletal structure providing for attachment of the bones of the legs to the rest of the body including the three fused hipbones
Hip bone - Illium - Large upper part, felt in the lower margin of the waist
Ischium - Lower part on which the body rests in sitting position
Pubis - Anterior part, bone felt at lower part of the front of the abdomen
Iliac crest - Bony ridge below waist
Femur - Thigh bone
Acetabulum - Cavity in hip bone that receives head of femur
Patella - Knee cap
Inguinal region - Groin
Tibia - Shin bone
Fibula - Calf bone
Malleolus - Ankle bone or the protuberances on both sides of the ankle joint
Tarsal bones - Seven bones of the ankle
Metatarsal bones - Five bones in the foot
Hallus - Big toe
Spinal column - Consists of 33 vertebrae:
7 cervical vertebrae
12 thoracic vertebrae
5 lumbar vertebrae
5 sacral vertebrae
4 coccygeal vertebrae

Treatment Techniques:

Rotation - Twisting at the waist to break up midline spasticity
Inversion - Head lower than feet in a prone position with the head toward the floor. This provides proprioceptive stimulation by way of the labyrinths which encourages tonic contraction of midline stabilizers.
Joint approximation or compression - Intermittent pressure down through one or more joints. **Precautions:** Joints should be in straight alignment. Joints receiving pressure should be stabilized above and below.

General Terms:

C.N.S. - Central Nervous System is composed of the brain, the spinal cord, and the spinal nerves
Autonomic Nervous System - Concerned with involuntary bodily functions. Controls functions of glands, smooth muscle tissue and the heart. Divided into sympathetic (fight or flight reactions to maintain life in emergency situations) and parasympathetic (peace time reactions to maintain life support bodily functions).
Receptors - Group of cells functioning in reception of stimuli; each of the senses have receptors that detect stimuli

Afferent - Sensory; conveying impulses toward nerve center

Efferent - Motor; coming from nerve center

Proprioception - Awareness of posture, movement and changes in equilibrium and knowledge of position, weight and resistance of objects in relation to the body. It is information arising from the body, especially from muscles, joints, ligaments, and receptors associated with bones. The vestibular sense is usually considered separately, but is within the category of proprioception. It is critical to motor planning. Proprioceptive flow toward the brain is believed to aid in sensory perception, especially of visual impulses.

Proprioceptors - a receptor that responds to stimuli originating within the body, especially those responding to pressure, position and stretch. Examples are muscle spindles, golgi tendon organs (GTO), pacinian corpuscles, and labyrinthine receptors.

Kinesthesia - Conscious awareness of joint position and movement arising from stimulation of joint receptors rather than other proprioceptors

Body Image - Awareness of body from interaction with the external world

Laterality - Internal awareness of right and left sides of the body

Vestibular System - Includes the receptive apparatus in the inner ear (motion) recorded by semi-circular canals; gravity, by the saccule and utricle, the vestibular nuclei, tracts and the cortical parts that make connections with nuclei and tracts. Enables the person to detect and interpret motion, especially acceleration and deceleration and the earth's gravitational pull. It has strong influence on muscle tone through certain neuro-muscular reflexes; this basic role in the muscle function is important in developing and maintaining body scheme. Body scheme is in part dependent on interpretation of movement of limbs. Vestibular stimulation will inhibit if motion is slow and rhythmical and excite if motion is rapid. The end product of a well integrated vestibular system is good righting and equilibrium reactions.

Vestibule - Small cavity or space at the beginning of the semi-circular canals

Semi-circular Canals - Passages in the inner ear containing liquid. As the head turns, the movement and distribution of the liquid causes motion to be detected. They are considered part of the vestibular system.

Labyrinthine - Pertains to the labyrinths; general term which refers to the intricate communication passages (semi-circular canals and saccule and utricle) in the inner ear that house the sensory receptors of the vestibular system

Nystagmus - An involuntary, rapid, back-and-forth movement of the eyes. This reflex movement results from rotary movement which stimulates the semi-circular canals. 6 - 14 seconds of nystagmus following rotation is considered normal. Lack of nystagmus or short duration of 4 seconds or less may indicate dysfunction or lack of integration of some part of the vestibular system.

Muscle Tone - Normal muscle tone is low enough to allow movement but high enough to provide co-contraction for stable background postures

Hypotonic - Deficient muscle tone. This is a frequent characteristic of a disordered sensory integration system. This results in hypermobility of the joints as in Downs' Syndrome.

Flaccid - Having defective or drastically reduced muscle tone

Hypertonic - Too much muscle tone or spasticity thus preventing movement

Floppy - Having loose or weak posture and movement

Co-contraction - Occurs when two muscles with opposing actions contract simultaneously thereby stabilizing the joint. Required for head and trunk control and for background postures.

Phasic contraction - Short periods of contraction followed by relaxation

Tonic contraction - More prolonged contraction, essential for skeletal stabilization. The threshold for activating tonic muscle contractions is higher than activating phasic contraction. The most effective general type of sensory input which contributes to a tonic muscle contraction is proprioception. Example: inversion

Inhibition - The act of decreasing muscular response

Facilitation - The act of making an action easier, causing an increase of muscular response by sensory stimulation

Neck control - Ability to control the position of the head

Background Postures - All positions of the body when the midline of the body is stabilized while the head and/or limbs are active

Midline stability - Neck, trunk, hip, ankle co-contraction

Reflex - An involuntary response to a stimulus. It is specific, predictable and automatic.

Stretch Reflex - (Myotatic reflex) Contraction of a muscle as a result of stretching the same muscle, also known as myotatic reflex

Tonic Labyrinthine Reflex - Stimulus is position of the head in space. The response when in the prone position is dominance of flexion and when in the supine position, dominance of extension. The flexors are facilitated when the head is in the prone position. The extensors are facilitated when the head is in the supine position. Normal the first four months

Asymmetrical Tonic Neck Reflex - (ATNR) Stimulus is head movement. Stimulation is received by the neck proprioceptors. Response is when the head is turned, the arm on the side to where the face is turned tends to extend, the other arm tends to flex. The same pattern is sometimes seen in the legs also. Normal the first 6 months. Often used as diagnostic indicator of the severity of neurological damage. An obligatory ATNR after 6 months of age suggests cerebral palsy.

Labyrinthine Righting Acting on the Head Reflex - Beginning of the anti-gravity responses. Stimulus is changing position of the head in space. A response of the righting or lifting of the head up against gravity signifies the integration of the tonic labyrinthine reflex. It is the underlying reflex basis of the development of neck control. Beginning at one or two months of age and continuing throughout life. It is the beginning of a sequence of reflexes that will eventually enable the child to respond to gravity and to ambulate adequately

Prone Extensor Posture - Prone position, back arched, elbows flexed, hips and legs extended. One of the first steps in development of a child's postural responses is learning this anti-gravity response. This is the developmental step of integrating the tonic labyrinthine reflex to the system of postural responses. The labyrinthine righting reflex acting on the head is activated along with it

Pivot Prone - Same pattern as above. First pattern which develops stabilization; this posture activates deep tonic extensor muscles which are crucial to midline stability - neck, trunk control; hip stability.

Neck Righting Reflex - One of the earliest and most important reflexes. Stimulus is head turning; response is that the body follows. It is the beginning of the developmental sequence of getting to a prone position. In this developmental sequence, the prone extensor posture is one of the critical steps.

Body Righting on Body Reaction - Involves segmental rolling utilizing rotation. It signifies the integration of neck righting reflex.

Righting Reactions - Any of the many reflexes which align the head and body so that a person is in a position for locomotion, i.e. the head is raised so that the eyes can see ahead; the trunk and limbs reflexively align themselves with the head so as to assume a prone position

Protective Extension or Parachute Reactions - Stimulus is upsetting one's balance; response is protectively extending arm to prevent falling

Postural Reflex Mechanism - Maintains muscle tone high enough to resist gravity; retains flexibility to move in coordinated manners. Consists of righting and equilibrium reactions.

Equilibrium Reactions - Reactions more complex and of higher integration within the CNS than righting reflexes. Stimulus is change in the center of gravity. Reaction is an adjustment in body weight.

Balance - Maintaining equilibrium; not falling over; able to keep a steady position

Symmetrical - Straight alignment, both sides equal

Asymmetrical - Out of the midline; crooked, one side of the body is different from the other

Scoliosis - Lateral curvature of the spine

Kyphosis - Posterior curve of the spine. Backward convexity, similar to humpback but not the same.

Lordosis - Anterior curve of the spine in the lumbar area. Anterior convexity, similar to swayback.

Pathological - Abnormal

Perseveration - Unnecessary repetition of movements and/or speech

Cerebral Palsy - (CP) Cerebral refers to cerebrum, that part of the brain that is damaged during the developmental years. Palsy means the resulting loss of ability to move or control movement. C.P. is characterized by abnormal muscle tone, residual basic reflexes and developmental lag. The most common types include the following four:

1. Spastic - Characterized by too much muscle tone; hypertonic
2. Athetoid - Characterized by uncontrolled, continuous unwanted movement
3. Rigid - Characterized by very stiff movements and postures
4. Ataxic - Characterized by lack of balance; jerky, uncoordinated movements

Mixed Cerebral Palsy - Two or more of the above types appearing together

Spasm - Sudden involuntary tightening of muscles:

1. Clonic - (clonus) Characterized by alternate contraction (tightening) and relaxation
2. Tonic - Sustained

Hemiplegia - One side of the body is more affected or involved

Paraplegia - The legs are affected

Quadriplegia - The whole body is affected

Extensor Thrust - (total extension) Is an abnormal reflex pattern seen in the cerebral palsied, frequently causing loss of balance. It consists of total body extension with more distal and superficial extensors involved, not those responsible for midline stability. Often the head thrusts back in extension; mouth opens; spine, hips, knees and ankles extend. Legs may cross. The stimulus can be pressure or even a light touch on the back of the head or pressure on the balls of the feet. Supine positioning is often avoided with the C.P. because of the extensor thrust. Residual tonic labyrinthine reflex supine is often the cause of the extensor thrust.

Opisthotonos - When supine, an arched position of the body with feet and head on the floor. When supine there is a dominance of extensor tone caused by residual tonic labyrinthine reflex supine often resulting in intermittent tonic spasms. Seen in severe cerebral palsied.

Scissoring - As seen in an abnormal C.P. gait pattern; occurs when the legs cross each other caused by a dominance of extension; adduction and internal rotation

Tongue Thrust - (Reverse swallowing) Is an abnormal movement pattern seen in C.P. The tongue is thrust forward as swallowing occurs.

Associated Reactions - Seen in C.P.; increase of stiffness in spastic arms and legs resulting from effort. Muscle tone increases in spastic muscles. May involve imitation of movement in other parts of the body - mirroring in other hand, for example.

Spina Bifida - Occurs when some of the vertebrae or bony units of the spine which normally cover and protect the spinal cord fail to fully develop

Spina Bifida Occulta - Is one type where although some of the vertebrae are incompletely developed, the spinal cord is normal, the skin is normal and there is no protrusion on the back. It occurs in more than 30% of all births. This condition may not be totally debilitory but may be responsible for many lower back problems.

Spina Bifida Manifesta - Occurs when not only the vertebrae fail to develop fully but the spinal cord fails to form into a tube and send out a sufficient number of nerve fibers to the muscles. The spinal cord in the shape of a flat plate, protrudes from the surface of the body and is not covered by the backbone but only by the meninges.

Myelomeningocele - (Meningomyelocele) Describes the spinal cord when it is in the shape of a flat plate instead of a normal tube. Spina Bifida with portions of the cord (Myelo = nerves) and membranes (meninges = membrane) protruding

Hydrocephalus - Is the abnormally rapid and excessive enlargement of the head. This condition occurs in many infants with spina bifida due to an interference with cerebrospinal fluid circulation and/or absorption.

Shunt - Is a slender tube inserted into the brain cavity and led outside the skull underneath the skin behind the right ear and then by way of the jugular vein in the neck, into the heart or into the cavity around the intestines. Other routes

are sometimes followed. Through this tube, cerebrospinal fluid is redirected, bypassing the point of obstruction in the brain cavity, into a route where it circulates with the blood and is handled as waste.

Ostomy - Is a surgical operation that creates a new outside opening for body waste; either for feces, urine or both

Stoma - That portion of the intestines that protrudes to the outside

Ileostomy - Ostomy made from the ileum, the last portion of the small intestines. It conducts bowel movement, involuntarily to the outside to a collecting pouch that can be emptied at will.

Ileal Conduit - Is when a segment of the ileum is converted into a conduit or pipeline for urinary drainage. It conducts urine involuntarily to the outside to a collecting pouch that can be emptied at will.

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